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VI. *Observations on the diurnal changes in the position of the horizontal needle, under a reduced directive power, at Port Bowen, 1825. By Lieutenant HENRY FOSTER, R. N. F. R. S. Communicated January 12, 1826.*

THE daily variation of the horizontal needle is a subject which has, for nearly a century, attracted the attention of several accurate observers, whose object was principally limited to determining the hour of the day, when its amount was the greatest, and the times of the needle's successive easterly and westerly motions.

From these observations, however, it could not be ascertained whether the cause of this daily variation proceeded from an actual change in the direction of the magnetic axis of the earth, or whether it arose from some foreign force, acting transversely on the needle, impelling it out of its natural direction. To submit this question to the test of observation, Mr. BARLOW, in 1823, undertook a set of experiments on the daily variation of a horizontal needle nearly neutralized by the application of artificial magnets; under an idea, that if the daily variation proceeded from an actual change in the direction of the earth's magnetism, the needle in this case, as when in its natural state, would merely take up its new direction without any increase of amount; but if it proceeded from a foreign force acting transversely upon it, the needle now having less intensity of direction than when in its natural state, it would yield more easily to this transverse force and give a larger expression, which would

serve to mark with more precision than heretofore, all the circumstances of this daily change. On trial, the amount was found to be very considerably increased; and he, still in pursuit of the same object, now undertook to ascertain the direction which the daily variation impressed upon the needle, when balanced at different azimuths; which was easily done by a slight adjustment of the magnets; and in this way he found that in two positions of the needle, *viz.* when its north end was directed either to N 16° W, or S 16° E, no daily variation, or a very little took place, and that on one side of this line, the needle passed in one direction, and on the other side in an opposite one.

In the memoir which the Author published relative to these experiments, he expresses a wish that some other persons would pursue this enquiry; and as the parts in which we were likely to winter in the recent voyage of discovery under Captain PARRY, seemed highly favourable for the purpose, I determined to avail myself of this circumstance, and to make a regular set of such observations.

With respect to the daily variation, it was soon found, as was expected, that the needle being nearly neutralized by the great amount of dip, no artificial means would be necessary for increasing its amount: all the observations, therefore, on this head, were made with the needles suspended in their natural state, and the following are entirely devoted to the second object, *viz.* of determining the direction which the needle takes in consequence of the daily variation when directed to different points of the compass, and to ascertain the line of no daily variation, or at least that line in which the motion is a minimum.

Mr. CHRISTIE, in pursuing the experiments above referred to, and in those on the effects of temperature on magnets, had made use of an instrument admirably suited to such purpose ; and he very obligingly superintended the construction of one somewhat similar for my use ; a description and drawing of which he has given in his paper on the effects of temperature on magnets, published in the *Phil. Trans.* for 1825.

In these experiments, the apparatus was frozen to three firm stone supports, erected in a house built of snow, having the top covered with canvas ; the zero on the compass-box was made to coincide with the direction of the needle at 6^h A.M., that being, although somewhat arbitrarily considered (from the mean of the preceding month's observations on the daily variation), the magnetic meridian. The needle used was made of clock spring, very delicate and light, in length 4,5 inches, its greatest breadth at the centre was 0,45 inches, and its extremities terminated in sharp points ; the pivot on which it rested was also repolished previous to the commencement of the observations.

Having considerably reduced the directive power of this needle in its natural direction, by the action of two bar magnets, placed in the magnetic meridian, and in the same horizontal plane with it ; I began on the 14th of February to register the amount of the daily change at stated intervals throughout the twenty-four hours, the Officers of the ship kindly assisting me, by taking the observations at the times of my attendance to other duties. The states of the two thermometers placed upon the instrument, were also noted at the time of every observation ; and to preserve the intensity of the magnets from being affected by any sudden change

of temperature, produced by the approach of the observer, or other causes, they were thickly covered with snow after every adjustment.

During that part of the day when the needles suspended with floss silk indicated westerly variation, the direction of this needle is marked towards the *right hand*, when the *north end passes to the right hand of a person standing outside of the compass-box, and facing the north end of the needle*; and to the *left*, when it passes towards the *left hand*.

In the following details is given a short description of the adjustment of the magnets to the needle, at the commencement of the observations in each position of its north end; and also the time in which it performed one vibration when under their influence, as well as the ratios in which the directive force was reduced by them; but it must be remembered, that these ratios are mere approximations, since the directive force was always so much diminished, that a sufficient number of vibrations could not be counted, to estimate the duration of one with the required exactness. In the annexed tables every phenomena, such as halos, aurora borealis, winds, state of the weather, and position of the moon, are inserted; together with such remarks, as suggested themselves at the time of observation. There is also inserted in italics in the column of remarks; max. easterly and westerly variation, opposite the hours at which they respectively took place by the suspended needle No. 2, in order to define the time of the day when the motion of this needle was towards the right, or left hand, as above described. And to point out the times of maximum westerly and easterly deflections of this needle, the signs + and — are prefixed to the hours of observation when they respectively happened.

North end of Needle to the North.

The magnets being placed to the north and south of the needle, with their axes coinciding with the magnetic meridian, the north magnet had its north pole, and the south magnet its south pole, directed towards the needle, at the distance of 31,5 inches from the centre of the compass-box. In this position of the magnets, the needle made one vibration in 15 seconds, so that the directive force was reduced in the ratio of 0,14 to 1 nearly.

Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of Needle.	Temp. Fahrenh.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.
	h. m.			Instr.		m. s.			
1825. Feb. 14th	0 30	A. M.	N 3 20 E	—19	.....	.....	Calm	Hazy	Aurora faint.
	1 00		4 50	—19	.....	.....	.....	.....	Aurora not vis.
	—2 00		5 00	—19	.....	.....	.....	.....	Max. easterly variation.
	2 25		5 00	—19	.....	.....	.....	.....
	6 35		5 00	—20	.....	.....	N. Fresh	Ditto	
	6 40		4 30	—20	.....	.....	
	6 45		3 40	—20	.....	.....	
	7 00		1 30	—20	.....	.....		Cloudy to the eastward	
	7 42		North	—20	.....	.....	
	7 52		N 3 00 W	—20	.....	.....	
	10 00		4 30	—20	..	.....	N. Light	Clear and fine	
	10 10		5 30	—20	To the right hand.	.....		
	11 00		8 00	—20		.....		
	11 17		8 20	—20		.....		
	11 32		8 20	—20		.....		
	11 47		8 40	—20		.....		
	Noon		8 40	—20		.....		
	0 32	P. M.	9 00	—20		.....	NE Fresh	Squally	Max. westerly variation.
	0 35		10 00	—20	.....	.....	
	0 37		10 30	—20		.....		
	0 40		10 55	—20		.....		
	+ 0 42		11 00	—20		.....	NNW	Moderate	
	1 5		11 00	—20	.....	.....	
	1 23		11 00	—21		.....		
	2 00		11 00	—21		.....		
	2 20		11 00	—21		.....		
	2 32		10 30	—21		.....		
	2 45		10 00	—21		.....		
	8 10		0 20	—21		.....		
	8 20		N 2 5 E	—21		.....		
	9 33		2 50	—23		.....		
	10 35		8 50	—22½		.....		
	10 37		10 20	—22½		.....		
	10 52		10 40	—23	.....	.....	Ditto	Ditto	Max. easterly variation.
	11 2		10 10	—23		.....		
	11 30		10 10	—23		.....		
	11 52		10 00	—23		.....		

[illegible]

North end of Needle to the North.

At this time the magnets placed north and south of the needle, had their axes inclined to the magnetic meridian at an angle of 22 degrees, and the distance of their nearest ends from the centre of the needle was 32.95 inches. The time in which the needle now performed one vibration, was 10.24 seconds, and the directive force reduced in the ratio of 0.325 to 1.

Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of Needle.	Temp. Fahren. Instr.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.
1825. Apr. 15th	h. m.	A. M.	N 0 0 E	0	.....	m. s. 18 7.8	NE by N	Squally hazy low down	
	1 20		N 2 30 E	-10	.....	18 7.8			
	1 30		N 2 40	-10	.....	18 11.8			
	1 50		N 2 40	-10	.....	18 11.9			
	2 15		N 2 00	-10	.....	18 10.5			
	3 00		N 0 30 W	-10½	.....	18 0.8			
	4 00		N 1 20	-11	.....	18 0.4			
	5 10		4 00	-11	..	17 55			
	6 00		4 30	-12	..	18 2.8			
	6 50		8 20	-12	..	17 59			
	6 51		8 30	-12	..	18 4.8			
	8 00		9 30	-11	..	18 0.5			
	9 4		9 30	-11	..	17 42.7			
	10 5		9 50	-9	..	17 47.5			
	11 00		10 20	-7	..	17 52			
	+ Noon		10 40	-7	..	18 1.2			
	0 30	P. M.	8 00	-5	..	18 11			
	1 00		6 30	-5	..	18 8.5			
	1 30		6 30	-5	..	18 8.2			
	2 00		2 10	-5	..	18 7.5			
	2 30		2 10	-5	..	18 0.4			
	2 45		5 00	-5	..	18 8.7			
	3 00		5 10	-5	..	18 8.5			
	4 30		9 00	-6	..	18 10.5			
	5 5		9 50	-7	..	18 9.3			
	+ 5 55		10 20	-8	..	18 7.7			
	6 55		9 10	-8	..	18 39.1			
	6 57		8 40	-8	.....	18 30.6			
	7 52		8 25	-9	.....	18 31.2			
	9 7		8 00	-9	.....	18 52			
	10 5		7 20	-10	.....	18 25.6			
	11 4		6 50	-10	.....	18 16.8			
	Midn ^t		6 50	-10	.....	17 57.5			
Apr. 16th	5 10	A. M.	N 8 50 W	-11	.....	18 10.8			
	6 00		5 40	-10	..	18 10.8			
	6 20		7 30	-9½	..	18 16.8			
	7 00		10 10	-8½	..	17 57.5			
	8 00		10 40	-6½	..	18 10.8			
	9 15		10 25	-2	..	18 10.8			
	10 10		12 00	-1	..	18 10.8			
	+ 10 15		12 5	-1	..	18 10.8			
	10 30		12 5	-1	..	18 10.8			
	11 10		9 30	+ 1	.....	18 10.8			
	11 32		9 20	+ 1	.....	18 10.8			
	0 58	P. M.	7 40	+ 2	.....	18 10.8			
	1 25		7 10	+ 4	.....	18 10.8			
	1 30		6 30	+ 4½	.....	18 10.8			
	1 57		6 10	+ 5	.....	18 10.8			
	3 00		3 20	+ 5	.....	18 10.8			
	4 00		3 30	+ 5	.....	18 10.8			
	5 15		7 10	+ 3½	.....	18 10.8			

Max. westerly var. This needle was frequently observed to vibrate in very small arcs, as it proceeded to the eastward from its Max. westerly position; as well as in its progress again to the westward, from 2^h to 6^h P. M. It is also worthy of remark that during the same interval, the intensity of the horizontal needle was observed to be very changeable, and the action of the suspended needles very irregular.

Max. easterly var. Squally with drift

Max. westerly var. happen^d at 2^h A. M.

North end of Needle to the North.									
Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of Needle.	Temp. Fahrenht.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.
	h. m.			Instr.		m. s.			
1825.									
Apr. 16th	6 00	P. M.	N 7 10 W	+ 2 $\frac{1}{2}$	.....	18 19,6			
	7 00		7 10	Zero	.....	18 19,3			
	8 00		6 50	— 1	.....	18 17,5			
	9 00		5 40	— 3	.....	18 20,9	Calm	Clear and fine	
	9 30		5 30	— 4	.....			
	10 10		5 30	— 4	.....	18 33,5			
	10 30		5 30	— 4 $\frac{1}{2}$	.....			
	11 10		3 5	— 4 $\frac{1}{2}$	.....	18 37			
	— 11 55		3 00	— 5	.....	18 36,7	.....	.....	Max. easterly variation.
Apr. 17th	1 5	A. M.	3 30	— 6	.....	18 40,7			
	2 7		4 10	— 6	.....	18 43,3			
	2 52		4 30	— 7	.....	18 44,2			
	3 10		5 20	— 7	.....			
	4 5		7 30	— 7	.....	18 54,2			
	5 0		8 20	— 7	.....	18 27,5			
	5 30		6 20	— 6	.....			
	6 00		7 30	— 6	.....	18 37,5			
	6 30		8 00	— 5	.....	.....	Easterly light		
	7 00		8 30	— 5	.....	18 39			
	7 30		8 40	— 5	.....	18 44,5			
	9 00		8 40	+ 0 $\frac{1}{2}$	.....	18 49,5			
	9 40		11 30	+ 2	.....			
	10 00		12 30	+ 3	.....			
	10 30		13 30	+ 3 $\frac{1}{2}$	.....			
	11 00		13 30	+ 4	.....			
	11 30		15 20	+ 6	.....			
	+ Noon		17 30	+ 6 $\frac{1}{2}$	.....	.....	.....	.....	Max. westerly variation.
	1 5	P. M.	12 50	+ 7	.....			
	1 30		8 00	+ 7	.....			
	2 2		5 00	+ 6	.....			
	9 30		7 00	— 3 $\frac{1}{2}$	.....	18 32,0			
	10 00		6 10	— 3	.....	18 23,5			
	10 30		6 00	— 4	.....			
	11 00		5 40	— 5	.....	18 20,0			
	11 30		4 30	— 5	.....			
	Midn ^t		North	— 5	.....	18 46,0	Calm	Clear fine weather.	Max. easterly variation.

North end of Needle to the South.

In this case, the adjustment of the magnets was the same as in the preceding observations on the 14th of February, with this exception, viz. that their ends nearest to the needle were 27 inches from the centre of the compass-box; the needle under these circumstances making 1 vibration in 14 seconds, and the directive force reduced in the ratio of 0,154 to 1.

Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of Needle.	Temp. Fahrenht. Instr.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.
1825. Feb. 17th	h. m.		0 /	0		m. s.			
	0 20	A. M.	S 5 20 E	—22	.....	.....	NNW	Hazy	
	0 45		5 40	—22	.....	.....	Light	weather	
	1 00		5 40	—22	.....	17 52,5	.....	.....	Max. easterly variation.
	4 40		5 40	—22	.....	17 56,4			
	5 50		5 40	—23½	.....	.....	
	6 15		5 40	—23	.....	17 59,5			
	7 40		5 40	—22	.....	17 55			
	9 00		5 40	—22	.....	17 54,3			
	9 37		5 30	—21½	.....	.....	Calm	Hazy	
	10 7		5 30	—21½	.....	17 52		weather	
	10 30		5 30	—21	.....	.....	
	11 10		5 30	—21	.....	.....	
	11 20		5 20	—21½	.....	17 50,5			
	Noon.		5 20	—21½	.....	18 1	North		
	0 45	P M.	3 40	—21	..	17 57,8	Light		
	1 20		3 20	—21	..	.....	
	1 30		3 00	—21	..	.....	
	1 40		2 00	—21	..	.....	
	1 45		0 50	—21	..	.....	
	2 00		0 40	—20	..	.....	
	2 12		0 20	—20	.....	17 51,7	.....	.....	Max. westerly variation.
	2 30		South	—20	.....	.....	.....	.....
	2 45		S 0 20 W	—20	.....	.....	.....	.....
	+ 3 00		0 40	—20	.....	.....	.....	Hazy to the eastward	
	3 5		1 00	—20	.....	17 50,8	North Fresh	Clearover	
	3 20		1 00	—20	.....	.....	.....	head and	
	4 12		0 50	—20	.....	17 47,2	.....	to the westward	
	6 00		0 40	—21	.....	17 51,4	.....	.....
	7 35		0 40	—21½	.....	17 50	.....	.....
	8 10		S 1 40 E	—22	.....	.....	.....	.....	Aurora faint to the N. E. by compass.
	8 30		2 30	—21½	.....	.....	.....	Hazy	Aurora not visible at 8.30.
	9 00		2 50	—21½	.....	.....	.....	.....
	9 30		3 00	—22	.....	.....	.....	.....
	9 50		4 10	—22	.....	.....	.....	.....
	10 00		6 00	—22	.....	17 47,3	.....	.....
	10 10		6 20	—22	.....	.....	.....	.....
	10 30		6 20	—22	.....	.....	.....	.....
	11 00		6 20	—22	.....	17 50	.....	.....
	11 30		6 40	—22	.....	.....	.....	.....
	Midn ^t		6 40	—22	.....	17 52,5	.....	.....

North end of Needle to the South.									
Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of Needle.	Temp. Fahren't.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.
	h. m.			Instr.		m. s.			
1825. Feb. 18th	0 15	A. M.	S 6 40 E	—22	.....	.....	NNE Light	Clear	
	0 18		7 10	—22					
	0 30		8 20	—22					
	0 40		8 40	—22					
	0 15		9 20	—22					
	0 55		9 50	—22	.....	.....	NNE Light	Clear	
	1 00		10 00	—22	.....	17 55,9		.....	Max. easterly variation.
	1 5		10 15	—22					
	1 15		10 30	—22					
	—1 25		10 50	—22					
	1 35		10 40	—22					
	1 55		10 30	—22	.....	17 57,3			
	2 30		10 30	—22					
	3 00		10 00	—21½	.....	17 56,8			
	3 30		9 40	—22					
	3 56		9 40	—22	.....	17 58,8			
	5 00		9 40	—22	.....	18 4,2			
	6 2		8 40	—22	.....	18 4,3			
	7 12		8 40	—22	..	18 2,0			
	8 8		8 35	—23	..	17 59,3			
	9 30		7 50	—23	..	18 00,0	NE Light	Fine and Clear	
	10 00		7 00	—23	..	17 52,2			
	10 35		6 10	—23					
	11 5		5 30	—23	..	17 49,6			
	11 30		5 20	—23	To the left hand.				
	Noon.		5 10	—23	.....	17 49,2			
	+ 0 30	P. M.	5 00	—23	.....	.....	.....	.....	Max. westerly variation.
	1 00		5 10	—23	.....	17 50,5			
	1 30		5 10	—23	.....			
	2 00		5 10	—23	.....	17 52,5			
	2 30		5 10	—23	.....			
	— 3 00		5 20	—23	.....	17 54,5			
	8 50		5 10	—24½	.....	.....	Calm	Hazy, low to the west ^d	
	9 30		5 10	—25	.....	17 53,2			
	10 00		5 10	—25	.....	17 56			
	10 30		5 10	—24	.....	.....	Northerly Light	Clear and fine	Needle nearly stationary, from 0 ^h 30 ^m P. M. until 0 ^h 30 ^m A. M. on the 19th.
	11 00		5 00	—25½	.....	17 54,8			
	11 30		5 00	—25					
	Mid ^d .		5 00	—25	.....	17 54,2			
Feb. 19th	0 30	A. M.	5 00	—25	.....	18	NNE Lt.	Fine wea.	
	1 00		4 40	—25	.....	18 1,5			
	1 30		4 40	—25					
	1 55		4 40	—25	.....	18 00			
	2 20		4 40	—25					
	3 15		4 40	—25	.....	18 00	Calm	Clear	Max. easterly variation took place at 5 ^h 3 ^m .
	3 55		4 40	—25	.....	18 12			
	6 00		4 40	—25	.....	17 59,8	.....	Hazy	
	7 00		5 00	—25	.....	18 00,7			
	7 25		4 50	—25					

North end of Needle to the South.									
Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of Needle.	Temp. Fabrent. Instr.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.
1825. Feb. 19th	h. m.	A. M.	S 0 00 E	—25	To the left hand.	m. s.			
	7 40		3 40	—25		.....	.....	Overcast	
	7 50		3 40	—25		18 3,6			
	8 00		3 40	—24		18 3,7			
	9 30		3 20	—24½		17 56,5	.....	Snow	
	10 00		3 15	—24½		18 2,5			
	10 30		3 10	—24½					
	11 30		3 10	—24½					
	Noon		2 55	—24½		17 56,5	.....		Max. westerly variation.
	0 10	P. M.	2 50	—24½					
	0 20		S 0 30 W	—24½					
	0 30		1 00	—24½					
	0 45		1 10	—24½		.....	.....	Clear	
	1 00		1 10	—24½		18 2,3			
	1 30		1 10	—24½					
	2 00		1 20	—25		17 54,5			
	+ 2 30		1 30	—25					
	2 50		1 30	—25		17 50			
	3 30		1 30	—25					
	4 00		1 20	—26½		17 49			
	5 00		1 20	—26		17 50,5			
	6 5		1 30	—26		17 51,3			
	7 3		1 10	—27		17 51			
	7 45		1 00	—27		17 55,6			
	9 10		1 20	—27		17 53,2			
	9 30		1 00	—27					
	10 00		0 30	—27		17 56,7			
	10 30		South	—27					
	11 00		S 0 30 E	—27		17 54,5			
	11 40		0 40	—27½					
	Mid.		1 00	—27		17 54,5	NE Light		
Feb. 20th	0 35	A. M.	1 20	—27		.....	Calm	Clear and fine.	
	1 00		1 30	—28		17 55,8			
	1 10		2 00	—28					
	1 30		2 20	—27					
	2 00		2 40	—27		17 57,2			
	2 10		2 50	—26½					
	2 30		3 00	—26½		.....	.....		Max. easterly variation.
	2 40		3 00	—26½					
	2 50		3 10	—26½					
	3 00		3 30	—26½		17 58,1			
	3 30		3 30	—26½					
	4 00		3 30	—26½		18 00,3			
	6 3		3 20	—28		17 59,5			
	7 3		3 20	—29		18 0,3			
	7 45		3 20	—29		17 59,5			
	9 00		3 20	—28		17 58			
	9 45		3 10	—28					
	9 55		3 00	—28		17 56,2			
	10 20		3 00	—28		18 7,8			
	11 36		3 00	—28	Very little motion to the left hand.				

North end of Needle to the South.									
Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of needle.	Temp. Fahrenh. Instr.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.
1825. Feb. 20th	h. m. Noon	P. M.	S 2 50 E	—28	..	m. s. 17 58,3	Northerly Light	Clear and fine	Max. westerly variation.
	0 7		2 00	—28	..				
	0 30		2 00	—28	..				
	1 00		1 30	—28	..	17 53,7	.....	.....
	1 22		South	—27	..				
	2 00		S 0 20 W	—28	..				
	+ 2 5		0 30	—28	..	17 50,3			
	2 10		South	—28	..				
	2 30		S 0 10 W	—28	.....	17 50,5		
	2 55		0 10	—28	.....			
	3 20		0 10	—28	.....			
	3 35		S 3 00 E	—28	.....	17 57,2		
	3 52		3 40	—28	.....	17 54,5		
	5 8		3 50	—28½	.....	17 53,8		
	6 00	A. M.	3 50	—29	17 54	Ditto	Ditto	Max. easterly variation.
	7 10		3 40	—29½	.....	17 54,7		
	7 40		3 30	—29½	.....	17 57,5		
	9 3		3 40	—30	.....	17 55,6		
	9 50		3 40	—29	.....	17 57,2		
	11 00		3 40	—30	.....	17 59,4	.....	.....
	11 50		3 40	—31	.....			
	0 35		3 30	—30	.....	17 54,3	Northerly Light	Clear and fine
	1 00		3 40	—30	.....	17 54,7	N. west- erly	
	1 30		3 40	—30	.....	17 57,7		
	2 00		3 40	—30	.....	18 0,5		
	2 30		3 40	—30	.....	18 9,2	Calm	
	3 00		3 40	—30	.....	18 3,5		
	3 30		3 49	—30	.....			
	4 00	P. M.	3 40	—30	17 59,1			Max. Westerly variation.
	4 20		3 40	—31	.....			
	5 5		3 40	—31	.....	17 57,5		
	5 30		3 50	—31	.....	17 58,5		
	6 00		3 50	—31	.....	18 4,5	Calm	Clear and fine
	6 28		3 50	—31	.....	17 51,8		
	7 00		3 50	—31	.....	17 50,7		
	7 35		4 00	—31	.....	17 49,8		
	7 52		3 50	—31	.....			
	9 30		3 40	—31	.....			
	10 00		3 30	—32	.....			
	10 20		3 20	—32	.....			
	+ 10 20		2 50	—32	.....			
	11 00		2 50	—32	.....			
	11 30		2 55	—32	.....			
	Noon	P. M.	2 50	—32				Observed the needle oscillate in small arcs previous to its becoming stationary from 10 ^h 20 ^m to 1 ^h P. M.
	0 30		2 50	—32	.....			
	1 00		2 50	—32	.....			
	1 30		3 00	—32	.....			
	1 40		3 10	—32	.....			
	2 00		3 20	—32	.....			
	2 30		3 30	—32				Parhelion on each side of sun. Needle gently oscillating in very small arcs.
	3 6		3 50	—30	.....			

North end of Needle to the East.

The axes of the magnets placed north and south of the needle, were on this occasion inclined to the magnetic meridian at an angle of 22 degrees; the distance of the nearest ends of each, from the centre of the compass-box was 28 inches, and the time of performing one vibration by the needle was 16,4 seconds, so that the directive power now, was to the undiminished force as 0,113 to 1.

Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of Needle.	Temp. Fahren't.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.
				Instr.					
1825. Feb 23rd.	h. m.					m. s.			
	1 00	A. M.	E 1 00 N	—26	.....	17 57,2	Eastward	Clear	
	1 55		E 2 00 S	—27	.....	18 3,6	.....	.....	Max. easterly var.
	3 00		10 00	—27	.....	18 5,2	.....	.....	Aurora bright
	4 15		8 00	—27	.....	18 2,6			to the north;
	5 30		7 30	—27	.....	18 3,4			at 4 ^h brilliant
	6 00		7 30	—27	.....	18 9,5			from NW to
	6 40		7 30	—27					NE by (com-
	7 00		4 40	—26½					pass.)
	7 5		10 00	—26½	.....	18 13,7			
	7 20		19 00	—26					
	7 25		18 30	—26					
	7 30		19 40	—26					
	+ 7 32		20 00	—26					
	7 35		20 10	—26					
	7 40		19 00	—26					
	7 42		18 50	—27	.....	.....	.....	.....	The max. westerly
	8 8		10 00	—27	.....	18 11,1	Easterly	Hazy	var. happened by
	8 12		9 30	—27	.....	.....	Fresh		the suspended
	9 10		4 40	—27	.....	18 1,5			needles at 10 ^h
	9 30		5 00	—27					48 ^m nearly. The
	9 40		6 10	—27					indications of this
	10 10		6 50	—26½	.....	18 2,3			needle appear to
	10 30		3 00	—26					be rather those of
	10 40		4 30	—26					changes of inten ^y
	11 00		4 00	—26	.....	17 59,3			than of direction,
	11 30		East						since the irregu-
	11 33		E 1 00 N	—26					larities (by com-
	11 36		0 30	—26					paring them with
	11 40		East						the times of vib.
	11 45		E 1 00 S	—25					of a hor. needle),
	Noon		2 00	—25	.....	17 59,6	East	Hazy	were found to fol-
	0 10	P. M.	1 30	—25	.....	.....	East		low that law.
	0 50		East	—25½	.....	.....	Fresh	Clear over-	Very cold W.
	1 00		E 3 00 N	—25½	.....	17 54,5		head, much	
	1 15		4 20	—25½				drift, wea-	
	1 25		5 10	—25½				ther very	
	1 30		5 10	—25½				cold.	
	1 35		5 00	—25½					
	1 45		5 20	—25½					
	2 00		5 30	—25½	.....	17 51,3			
	2 10		5 20	—25½					
	2 30		4 00	—25½					
	3 00		4 00	—25½	.....	17 54			
	3 25		4 00	—25½					
	3 55		4 00	—25½	.....	17 51,4			
	5 30		5 00	—25½	.....	17 50,1			

North end of Needle to the East.										
Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of needle.	Temp. Fahren ^t .	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.	
				Instr.						
1825.	h. m.		° ' N	°		m. s.				
Feb. 23rd	6 00	P. M.	E 5 00 N	—25½	17 53,7			Aurora faint to the northward.	
	6 40		5 00	—25½	.....	17 51,8			
	7 40		5 00	—26	.....	17 46,3	.....	.....
	8 30		6 20	—26						
	8 40		6 00	—26						
	9 00		5 10	—26	.....	17 50,7			
	9 10		4 10	—25						
	9 20		3 30	—25						
	9 30		3 30	—25						
	9 40		3 00	—25						
	9 45		3 20	—25						
	10 00		3 10	—25	.....	17 52,2			
	10 30		3 00	—25						
	10 45		2 30	—25						
	11 00		2 00	—25	.....	17 55			
	11 15		1 40	—25						
	11 30		1 30	—25						
	11 38		1 00	—25	.....				
Feb. 24th	Midn ^t	A. M.	1 00	—25	17 55,3	Eastward Fresh	Thick hazy Hazy weather	D ESE by comp. D E b S by comp. Max. easterly var.	
	0 5		0 40	—25	.....				
	1 26		East		.....	17 56,5			
	1 56		E 0 10 S	—25	.....	17 58			
	2 15		0 50	—25						
	2 40		1 00	—25						
	3 10		0 55	—25½	.....	17 56,3			
	5 40		2 30	—26	.....	18 0,6	.....	.....
	6 40		5 00	—26						
	+ 7 40		5 30	—27	18 1,5	Squally		Aurora faint.	
	8 56		5 10	—27	.....	18 2,7			
	9 40		4 45	—27	.....	17 55,8			
	9 55		3 00	—27	.....	17 52,8			
	10 30		2 30	—26½						
	10 50		1 30	—26½	.....	17 49,4			
	11 00		1 00	—26½	.....		.....	.....
	11 30		0 40	—26½						
	Noon	P. M.	0 50	—26½	.....	18 2,4	Max. westerly var. Needle proceeding to the northward by gentle vibrations in small arcs.		
	0 30		0 30	—26½						
	0 45		0 30	—26						
	1 15		E 0 30 N	—26	.....	17 52,3			
	1 30		1 30	—6						
	— 3 30		2 20	—27	.....	17 51,5			
	4 45		2 00	—26	.....	17 53			
	5 50		2 00	—25	.....	17 55,2			
	6 50		2 00	—25	.....	17 55,4			
	7 15		2 00	—25						
	9 12		1 50	—25	17 55,6		East Fresh	Cloudy	
	9 40		1 30	—25½	.....	17 54,1			
	10 25		1 30	—26						

North end of Needle to the East.									
Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of needle.	Temp. Fahr ^{nt} . Instr.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.
1825.	h. m.					m. s.			
Feb. 24th	10 50	P. M.	E 1 30 N	-26	.....	17 54,9	Mod.		D N. by comp.
	11 25		1 30	-26					
	Midn ^t		1 30	-26	.....	17 55,2			
Feb. 25th	1 00	A. M.	1 40	-26	.....	17 55,5	N. East ^{ly}	Clear	Max. easterly variation.
	3 30		1 40	-26½	.....	.....	moderate		
	4 00		1 40	-26½	.....	17 55,3			
	4 20		1 30	-26½					
	5 00		1 20	-26	.....	17 58,2			
	5 30		1 10	-25½					
	5 45		East	-25½	.....			
	5 50		E 3 00 S	-25½					
	6 00		3 00	-25½	.....	17 57,9	.....	.....	} Needle gently vibrating in small arcs.
	6 3		2 50	-25½	.....	.....	.....	.....
	6 4		3 00	-25½	.....	.....	.....	.....
	+ 6 30		3 10	-25½					
	7 00		3 00	-26	.....	17 59,4			
	7 30		3 10	-26					
	9 45		3 00	-26½	.....	17 58,2	.....	.....	Max. westerly
	11 00		3 10	-26	.....	17 59,2	Easterly	Clear and	var. took place
	11 46		3 00	-26			light	fine	at 10 ^h A. M.
	0 15	P. M.	3 00	-26	.....	17 58,9			
	1 00		2 30	-26	.....	17 55,2			
	1 20		2 30	-26					
	1 30		2 00	-26					
	2 00		1 30	-26½	.....	17 49,5	Easterly	Ditto	
	2 5		0 20	-26½	.....	.....	moderate		
	2 10		East	-26½					
	2 15		E 1 40 N	-26½					
	3 5		2 00	-26½	.....	17 53,6			
	4 0		2 00	-27	.....	17 53,8			
	5 7		2 10	-27	.....	17 52,9			
	6 5		2 00	-27	.....	17 54,5			
	7 0		2 00	-27	.....	17 55,8			
	7 40		2 00	-27	.....	17 56,2			
	9 00		2 00	-27	.....	17 54			
	9 30		2 00	-27					
	10 00		1 50	-27	.....	17 54,5	East	Hazy	
	10 30		1 40	-27			Fresh		
	11 00		1 30	-27	.....	17 54,8			
	Midn ^t		1 30	-27	.....	17 54,7			

North end of Needle to the West.

What has been said of the adjustment of the magnets at the commencement of the observations at East, obtain here also ; except that the axis of each magnet in this instance, was oppositely inclined to the meridian at an angle of 22 degrees, in order to direct the north end of the needle into its present position.

Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of needle.	Temp. Fahren. Instr.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.
1825. Feb. 26th	h. m.	A. M.	West	—27	.....	m. s.	East strong	Hazy	Max. easterly var.
	1 00		W 2 40 N	—27	.....	17 55,8			
	2 00		3 30	—27	.....	17 55,4			
	2 35		3 30	—26	.....	17 56,0			
	3 00		3 30	—26	.....	18 00,2			
	3 30		3 40	—26	.....	17 58,1			
	3 55		4 30	—25	.....	18 00,5			
	5 30		4 50	—25	.....	18 2,2			
	6 4		4 40	—25	.....	17 57,3			
	7 5		4 40	—21	.....	17 57,0			
	9 30		4 40	—21	.....	17 55,5			
	10 00		4 30	—21	.....	17 55,7			
	11 00		2 30	—21	.....	.....	ESE	Strong gales, withdrift.	
	Noon	P. M.	1 40	—21	.....	.....	
	1 00		1 00	—21	.....	17 56,5			Max. westerly var.
	1 30		West	—21	.....	.....	
	1 45		W 1 40 N	—21	.....	17 57,6			
	1 50		1 00	—21	.....	17 56,5			
	2 15		West	—21	.....	17 57,4			
	2 20		West	—21	.....	17 56,8			
	2 30		W 0 10 S	—21	.....	17 56,6			
	3 9		West	—19	.....	17 56,9			
	3 50		West	—19	.....	18 00			
	+ 5 30		W 0 15 S	—18	.....	18 00,5			
	6 20		W 0 10 N	—17	.....	18 1,3			
	6 55		0 10	—17	.....	18 1,5			
	7 40		0 20	—16	.....	18 1,5			
	9 30		0 30	—14½	.....	18 3,7			
	10 00		0 30	—14½	.....	18 3,8			
	10 30		0 30	—14½	.....	18 4,2			
	11 00		0 30	—14½	.....	18 3,5			
	11 30		0 30	—14½	.....	18 2,2			
	Midn ^t		0 40	—14½	.....	18 3,2			
Feb. 27th	0 15	A. M.	1 00	—14½	.....	18 5,0	Easterly light	Thick & hazy with snow	
	1 8		1 20	—14	.....	18 4,9			
	2 5		1 30	—14	.....			
	3 00		1 40	—14	.....			
	3 50		1 40	—14	.....			
	5 30		1 50	—14	.....			
	6 10		1 50	—14	.....			
	6 30		1 50	—14½	.....			
	7 00		1 50	—14	.....			
	7 55		1 55	—14	.....		Calm	Cloudy	
	9 00		1 55	—14	.....			

North end of Needle to the West.									
Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of Needle.	Temp. Fahr. Instr.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.
1825. Feb. 27th	h. m.		0 /	0		m. s.			
	9 30	A. M.	W 2 00 N	—14					
	10 00		2 00	—13	.....	18 7,5			
	10 34		3 00	—14					
	11 00		3 40	—12	.....	18 8,2	East Light	Hazy	
	—11 20		4 00	—13					
	11 46		3 40	—13					
	Noon.		2 30	—13	.....	18 4,0			
	0 20	P. M.	2 20	—12					
	0 30		2 20	—12					
	1 00		2 20	—12	.....	18 4,5			
	2 00		2 00	—12	.....	18 0,2	.....	.....	Max. westerly var.
	2 10		1 30	—12	.....	.....	East	Clear	☉ on north mag. merid.
	2 50		1 00	—12	.....	18 0,7	Moderate		
	4 30		0 50	—12½	.....	18 0,5			
	5 00		0 50	—12½	.....	17 59	Ditto	Cloudy	
	5 34		0 50	—12½					
	6 5		0 50	—13	.....	18 0,4			
	7 10		0 40	—13	.....	18 2,6	Ditto	Very Hazy	
	7 55		0 40	—13	.....	18 2,2			
	9 30		0 30	—13	.....	18 2			
	+10 5		0 20	—14	.....	18 2,4	.....	.....	Max. easterly var.
	10 58		0 20	—14	.....	18 1,1			
	11 30		0 20	—13½					
	Midt.		0 20	—13	.....	18 1,5			
Feb. 28th	0 15	A. M.	0 30	—13½	.....	18 1,0	North Moderate	Cloudy	
	1 20		0 40	—13					
	1 40		0 40	—13½					
	2 6		0 50	—13½	.....	18 2,3			
	2 30		0 50	—13½					
	3 00		0 50	—13½	.....	18 1,1			
	3 40		0 55	—13½	.....	18 1,4	N. W.	Hazy	
	5 6		1 10	—13	.....	18 4,1	Moderate		
	6 5		1 30	—13	.....	18 5,0			
	7 3		1 40	—13	.....	18 5,0			
	7 50		2 00	—14	.....	18 6,5			
	9 00		3 25	—14	.....	18 5,4			
	9 30		3 30	—14½	.....	.....	North Light	Clear and Fine	
	—9 40		3 40	—14					
	10 15		3 40	—14	.....	18 2,8			
	10 45		3 30	—14					
	11 00		3 00	—14	.....	18 1,5			
	11 25		3 00	—14					
	11 40		2 30	—14					
	Noon		2 30	—14	.....	18 0,5	.....	.....	Max. westerly var.
	1 00	P. M.	1 30	—14	.....	17 56,6			
	1 30		West	—14					
	2 00		West	—14	.....	17 59,3			
	2 20		West	—14					
	+ 2 45		W 0 30 S	—15	.....	17 58,8			

North end of Needle to the West.									
Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of Needle.	Temp. Fahrenheit.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.
	h. m.		° ' "	°		m. s.			
1825. Feb. 28th	5 6	P. M.	W 0 20 S	—17	.....	17 57,5	Easterly Light	Clear and Fine	
	6 3		0 5	—18	.....	17 57,3			
	6 55		W 0 20 N	—19	.....	17 59,6			
	7 00		0 30	—19					
	7 55		0 40	—19	.....	17 59,0			
	9 30		0 40	—20	.....	17 57,2			
	10 00		1 00	—20	.....	17 57,7			
	10 30		1 00	—20					
	11 6		1 00	—20	.....	17 57,6	Ditto	Overcast westward	
	11 40		1 00	—20					
	Mid ^t .		1 00	—20	.....	17 58,1			
March 1st	1 00	A. M.	1 00	—19 ¹	.....	17 59,5			
	1 30		1 00	—19					
	2 00		1 10	—18 ¹	.....	18 00	.....	.....	Max. easterly variation.
	3 00		2 30	—18 ¹	.....	17 59,3			
	5 10		4 00	—19	.....	18 1,4	S. W. Moderate	Hazy westward	
	6 8		4 30	—19	.....	18 3,3			
	7 6		5 00	—20	.....	18 4,8			
	7 40		7 50	—20	.....	18 8,2			
	9 00		7 30	—21 ¹	.....	18 11			
	9 30		7 30	—22					
	10 15		7 30	—22	.....	18 7,8	NE by E Fresh	Thick with drift	
	10 45		7 30	—23					
	11 15		7 30	—23	.....	18 9,5			
	11 45		5 30	—24	.....	.....	.....	.....	Max. westerly variation.
	Noon.		4 00	—24	.....	17 50,5			
	0 8	P. M.	West	—24					
	+ 0 30		W 0 30 S	—24 ¹					
	1 00		0 30	—24 ¹	.....	17 52	NE Fresh	Overcast	
	1 30		West	—24 ¹					
	2 00		West	—24 ¹	.....	17 53,2			
	2 30		West	—24 ¹					
	3 00		W 1 00 N	—25 ¹	.....	17 52,8			
	3 30		1 5	—25 ¹					
	4 4		1 15	—26	.....	17 54,3			
	5 10		1 30	—26	.....	17 55,2	North Light	Hazy	Max. easterly variation.
	6 00		2 00	—26	.....	17 56			
	7 00		2 10	—26	.....	17 56,6			
	7 50		2 10	—26	.....	17 57,8			
	10 30		2 00	—30	.....	17 55,0			
	11 00		2 00	—30	.....	17 54,0	N. Easterly Light	Clear and Fine	Mag. North.
	11 30		2 20	—30	.....	.....	
	Midn ^t		2 00	—30	.....	17 55,5			

It will be seen, that when the north end of the needle pointed towards the east or west, the direction of its motion during the time of westerly daily variation, is not specified according to the mode described; I have not ventured to do so, in consequence of the many irregularities in its direction, produced by the variations of horizontal intensity, which were always indicated by this needle, and which rendered its direction as to the *right and left hand* during the time of westerly daily variation, very doubtful.

North end of Needle to the S. W.

The distance of the nearest ends of the magnets from the centre of the compass 27 inches; the axis of each magnet was inclined to the magnetic meridian, and the needle under their influence made one vibration in $12\frac{1}{2}$ seconds; so that the directive force now, was to the undiminished force as 0,20 to 1.

Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of Needle.	Temp. Fahren. Instr.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.
1825. Mar. 2d	h. m.	A. M.	° ' W	°	.....	m. s.	Northerly Light	Clear and Fine	
	1 00		42 00	-29	.....	17 56,3			
	1 30		41 50	-30	.....	17 58			
	2 00		41 30	-29½	.....	17 58			
	2 30		40 50	-30	.....	17 59,1	Calm		
	3 20		40 20	-30	.....	18 9,3			
	4 00		39 50	-30½	.....	18 3	Easterly Light	Clear and Fine	
	5 6		40 00	-31	.....	18 3			
	6 8		40 20	-31	.....	18 1,8			
	7 6		41 20	-31	.....	18 1			
	7 54		41 30	-32	.....	18 00,5			
	9 00		43 20	-32	.....	17 53,2	.....	.....	Max. westerly variation.
	9 30		44 00	-32	.....	17 53,6	.....	.....
	10 00		45 30	-32	.....	18 2,2	.....	.....
	10 30		46 10	-31	.....	17 58,8	.....	.....	At 1 ^h 25' P.M. the needle commenced moving rapidly to the westward, intensity at that time increasing.
	11 00		46 20	-30	.....	17 48,5	.....	.....
	11 30		45 50	-30	.....	17 46,5	.....	.....
	0 15	P. M.	45 30	-30	.....	17 49	.....	.....
	0 35		45 30	-30	.....	17 53,6	.....	Very Hazy	
	1 00		45 30	-30	.....	17 52,8	.....	Clearer	
	1 30		49 30	-30	.....	17 54,4	.....	.....
	+ 1 40		50 15	-30	.....	17 52,7	.....	.....
	2 00		50 10	-29½	.....	17 53,5	Easterly Light	Clear and Fine	
	2 30		50 00	-29½	.....	17 54,2	.....	.....	Max. easterly variation.
	3 5		48 20	-29	.....	17 54	.....	.....
	3 55		47 40	-29	.....	17 57,0	Easterly Light	Clear and Fine	
	5 00		44 30	-29½	.....	17 59,6	.....	.....
	5 40		44 20	-29½	.....	18 1,3	.....	.....
	6 15		44 00	-29½	.....	18 8,5	Squally	Hazy	
	7 00		43 55	-30	.....	17 57,4	.....	.....
	7 40		44 00	-30	.....	.....	.....	.....
	8 00		44 00	-30	.....	.....	.....	.....
	9 00		44 00	-30½	.....	.....	.....	.....
	11 00		43 40	-31	.....	.....	.....	.....
	Mid ^d .		43 00	-31	.....	.....	.....	.....
Mar. 3d	1 10	A. M.	42 30	-31	.....	.....	.....	.....
	2 6		40 20	-31	.....	.....	.....	.....
	3 0		39 50	-31	.....	.....	.....	.....
	3 50		38 30	-31	.....	.....	.....	.....
	5 10		40 40	-31	.....	.....	.....	.....
	5 40		41 20	-31	.....	.....	.....	.....

North end of Needle to the SW.

Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of Needle.	Temp. Fahrenheit. Instr.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.
1825. Mar. 3rd	h. m.		0	0		m. s.			* This sudden change of the needle in an easterly direction is ascribed to a change of horizontal intensity, which is pointed out by the varying intervals in which the needle performed 60 vibrations.
	6 15	A. M.	41 30 W	—31	.....	17 55,5			
	6 50		42 00	—31½					
	7 25		42 50	—31½	.....	17 56,3			
	8 4		42 50	—31½	.....	17 57,1			
	9 50		40 00*	—31					
	9 55		38 30	—29	.....	18 13,3			
	10 20		37 30	—29					
	10 30		37 30	—29					
	—10 55		† 37 00	—29	.....	18 14,5	D South	mag ^t .	† This change is also considered to be produced by a change of horizontal intensity.
	11 00		38 50	—28½					
	11 20		45 30	—28½					
	11 35		47 10	—28½					
	11 40		47 40	—28					
	11 42		48 00	—28	.....	.....	Easterly moderate	Overcast	Max. westerly var. at 11 ^h 22 ^m A.M.
	11 50		49 30	—28					
	11 55		49 50	—28					
	Noon.		50 00	—28	.. ..	17 43,2			
	0 15	P. M.	50 00	—28	.. ..	.....	ESE Fresh	Hazy with drift	
	1 10		49 40	—28	.. ..	17 46,3			
	1 40		49 30	—28	.. ..			
	2 20		49 00	—28	.. ..	17 55,4			
	2 50		48 40	—28					
	3 10		48 40	—28	.....	17 52,4			
	3 45		48 40	—28	.....	17 46,7			
	+ 5 6		53 20	—27	.....	17 40,8			
	6 5		51 10	—27	.....	17 48,5	East, strong; thick near the horizon, clear over head.		
	7 4		51 00	—27	.....	17 46,8			
	7 50		45 30	—27	.....	17 49,6			
	9 30		45 30	—27	.....	17 53			
	10 15		45 25	—26½	.....	17 55,5			
	11 10		44 20	—26	.....	17 56,3			
	11 12		43 50	—26	.....	.....	.....	.....	Max. easterly var. 11 ^h 30 ^m D true South
	11 45		42 30	—26½	.....	.....	ESE moderate	.....
Mar. 4th	Midn ^t	A. M.	42 30	—26½	.....	17 57,5	ESE Squally	Hazy with drift	
	0 10		42 30	—26½	.....	.....	
	0 35		42 30	—26½	.....	.....	
	1 20		42 30	—26½	.....	17 55,6			
	1 55		42 30	—26	.....	17 56,7			
	2 20		42 30	—26	.....			
	2 50		42 40	—26	.....	17 57,4			
	3 10		42 40	—26½	.....			
	3 55		43 00	—26½	.....	17 57			
	5 12		43 40	—27	.....	17 57,8			
	—6 6		40 30	—27	.....	18 3,0	Easterly Light	Clear and Fine	
	7 8		41 40	—27	.....	18 1,2			
	7 50		42 50	—27	.....	18 2,6			
	9 00		40 30	—27	.....	18 2,3			
	9 40		41 40	—26½	.....	17 56			
	10 10		44 00	—26½	.....	.....	Calm	Clear and Fine	
	10 25		45 00	—26	.....			

North end of Needle to the S. W.									
Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of Needle.	Temp. Fahrenheit.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.
	h. m.		o. ,	o		m. s.			
1825. Mar. 4th	10 40	A. M.	S 45 00W	—26	To the left hand.	17 59,7	Calm	Ditto	Max. westerly variation.
	11 5		45 20	—26					
	11 10		46 20	—26					
	11 50		46 20	—26					
	0 30	P. M.	47 10	—26		17 56,3			
	1 00		47 20	—25		17 51,8			
	2 00		47 40	—25		17 50,5			
	2 5		50 00	—25					
	+ 2 10		50 25	—25					
	2 35		50 25	—25					
	2 38		49 30	—25	17 50	Easterly Light	Fine clear weather	
	3 00		49 5	—25					
	3 32		47 40	—25					
	4 00		47 00	—25		17 56,2			
	4 5		46 30	—25		.....		
	4 7		46 00	—25					
	5 10		45 10	—25		17 58,5			
	6 3		45 5	—26		17 54,3			
	7 6		45 0	—26		17 55,9			
	7 50		45 0	—27		17 53,3			
	9 00		44 50	—26½		17 49			
	9 30		44 40	—27	17 45,6	Easterly Light	Very clear and fine	Max. easterly variation.
	10 10		44 50	—27					
	10 50		44 50	—27½		17 50,7			
	11 30		44 50	—27½					
	11 56		44 50	—27½		17 55,8			

North end of Needle to the N. W.

In this case, the ends of the magnets nearest the needle were 29,4 inches from the centre of the compass-box, and the time of performing one vibration by the needle thus circumstanced was 14,4 seconds, so that the directive force now, was to the undiminished force as 0,15 to 1.

Mar. 5th	2 10	A. M.	N 48 00W	—26	To the right hand.	17 58	Easterly Light	Hazy	
	2 30		48 00	—26					
	3 00		48 10	—26		17 59,3			
	3 10		49 10	—26					
	3 15		50 00	—26					
	3 20		50 30	—26					
	4 00		51 30	—26		18 7			
	5 10		52 00	—26		18 0,5			
	6 6		51 30	—26		17 59,8			
	7 6		51 30	—26		18 5,0			
	+ 7 50		52 00	—26	18 1,8	Westerly moderate	Thick & Hazy	
	9 30		50 10	—25½		17 55,5			
	10 30		49 00	—26		17 51,2			
	11 00		48 40	—26		17 52,3			
	11 30		49 00	—26					
	11 35		48 30	—26					
	Noon		47 00	—25½		17 48,5			

North end of Needle to the N. W.									
Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of Needle.	Temp. Fahrenheit. Instr.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.
1825. Mar. 5th	h. m.	P. M.	N 46 00 W	0 —25½	.....	m. s. 17 53,4			
	1 00		45 40	—24½	.....	17 57,2	Westerly	Clear and	Max. easterly
	1 30		45 40	—24½	.....	17 54,5	Light	Fine	variation.
	2 00		46 10	—24½	.....	17 53,8			
	2 30		46 10	—25	.....	17 58			
	3 00		44 00	—25	.....	17 55,2			
	3 20		43 50	—26	.....	17 54			
	3 50		44 00	—27	.....	17 55,9			
	4 55		44 00	—27	.....	17 52,8			
	6 5		44 20	—26½	.....	17 53,7			
	6 45		45 20	—27	.....	17 54,8			
	7 40		45 20	—27	.....	17 55,9			
	9 10		45 30	—27	.....	17 56,8			
	9 32		45 45	—27	.....	18 6			
	9 58		45 30	—27	.....	18 9,5			
	10 30		45 35	—27	.....	18 4			
	11 4		45 30	—27	.....	18 9,2			
	11 27		45 30	—27	.....	18 2			
	Midnt		45 30	—27	.....	18 3			
Mar. 6th	1 10	A. M.	46 00	—27	.....	18 1			
	1 50		46 10	—27	.....	18 1,5			
	2 30		46 30	—27	.....	18 1,5			
	3 00		48 50	—27	.....	18 1,5			
	3 25		49 30	—26½	.....	18 1,5			
	3 40		51 00	—26½	.....	18 1,5			
	3 40		51 00	—26½	.....	18 1,5			
	3 50		52 30	—26½	.....	18 1,5			
	3 55		53 20	—26½	.....	18 1,5			
	5 5		54 00*	—25	.....	18 1,5			
	+ 6 10		60 00	—24	.....	18 1,5			
	7 5		52 30	—23	.....	18 1,5			
	7 53		54 00	—23	.....	18 1,5			
	9 00		57 20	—23	.....	18 1,5			
	9 5		57 00	—23	.....	18 1,5			
	9 40		58 10+	—23	.....	18 1,5			
	9 45		57 30	—23	.....	18 1,5			
	10 00		50 00	—23	.....	18 1,5			
	10 30		49 10	—23	.....	18 1,5			
	10 50		51 30	—23	.....	18 1,5			
	11 00		53 20	—23	.....	18 1,5			
	11 5		54 30	—23	.....	18 1,5			
	11 10		55 30	—23	.....	18 1,5			
	11 15		55 40	—23	.....	18 1,5			
	11 29		54 30	—23	.....	18 1,5			
	11 31		50 30	—23	.....	18 1,5			
	Noon.		49 10	—23	.....	18 1,5			
	0 5	P. M.	47 00	—23	.....	18 1,5			
	0 30		46 55	—23	.....	18 1,5			
	1 2		46 45	—23	.....	18 1,5			
	1 27		46 00	—23	.....	18 1,5			
	1 55		45 55	—23	.....	18 1,5			
	— 2 53		45 00	—24	.....	18 1,5			

North end of Needle to the N. W.									
Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of needle.	Temp. Fahren ^t .	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.
	h. m.		° ' "	°		m. s.			
1825. Mar. 6th	3 20	P. M.	N 45 00 W	—24	.....	.....	.....	.....
	3 45		45 00	—25	.....	17 54.5	S W mod.	Hazy	
	5 15		45 40	—27	.....	17 52.5			
	5 50		45 50	—27					
	6 15		46 00	—27	.....	17 51.8	West Mod.	Hazy	
	6 50		46 00	—27	.....	.....	
	7 15		46 10	—28	.....	17 52.3			
	7 50		46 10	—29	.....	17 52.7			
	8 54		46 00	—29	.....	17 50.5			
	9 15		45 50	—29½					
	9 45		46 00	—30					
	10 5		46 00	—30	.....	17 56.7	Ditto	Ditto	Max. easterly variation.
	10 58		46 10	—30½	.....	17 54.5	Stars scarcely visible through the haze.		
	11 50		46 10	—31½	.....	17 56.3	Westerly	Very hazy	
Mar. 7th	1 10	A. M.	46 30	—31	.....	17 55.6	Mod.		
	2 3		47 30	—31	.....	17 56.5			
	3 0		48 00	—31	.....	17 56.6			
	3 53		48 30	—31	.....	18 0.4			
	5 10		49 10	—31	.....	17 55.2			
	5 40		50 20	—31	.....			
	6 10		50 30	—31½	.....	17 59.7			
	6 50		50 50	—31½	.....	17 57.5			
	7 15		50 50	—31½	.....	.....	North Light	Hazy	
	7 50		51 00	—31½	.....	17 56.1			
	9 5		50 40	—31½	.....	17 59.8			
	+ 10 0		51 10	—30½	.....	17 57	.....	.....	Max. westerly variation.
	10 35		51 10	—30½	.....			
	10 40		51 00	—30	.....	.....	Calm	Clear and fine weather, a few thin clouds near the horiz.	
	11 10		51 00	—30	.....	17 56.2			
	11 30		50 55	—30	.....			
	0 5	P. M.	50 50	—30	.....	17 55.8	N W light		
	0 7		50 00	—30	.....			
	0 9		49 40	—30	.....			
	0 20		49 30	—30	.....			
	1 10		49 20	—29½	.....	17 53.3			
	1 40		48 30	—29	.....			
	1 55		47 50	—28½	.....	17 50.5			
	2 20		47 40	—28½	.....			
	2 50		47 40	—28½	.....			
	3 10		47 40	—28½	.....	17 53.4			
	3 58		47 30	—28½	.....	17 53.2			
	5 5		47 40	—29	.....	17 55.8	Easterly Light	Very fine and clear	
	6 5		47 50	—29	.....	17 54.6			
	7 3		48 00	—30	.....	17 55.6			
	7 52		47 20	—30	.....	17 54.5	.....	.....	Max. easterly var. happ nd at 2 ^h 50 ^m A. M. on the 8th.
	9 5		47 20	—30	.....	17 55.5			
	9 42		47 40	—30	.....			
	10 00		48 00	—30	.....	17 55	Easterly Mod.	Hazy	
	11 00		48 30	—30	.....	17 55.7			
	11 30		48 30	—30	.....			
	Midn ^t		48 20	—30	.....	17 56	.....	Very thick weather	

North end of Needle to the W. S. W.

In this position, both magnets were placed to the south of the compass; the north pole of one magnet, and the south pole of the other, were directed towards the needle, so as to attract each extremity; the distance from the centre of the box, to the end of the magnet attracting the north end of the needle, was 18,65 inches, and to that attracting the south end of the needle, 28,4 inches; the needle then made 1 vibration in 8,6 seconds, so that, the directive force was reduced in the ratio of 0,42 to 1.

Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of needle.	Temp. Fahren ^t . Instr.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.
1825. Mar. 14th	h. m.					m. s.			
	1 5	A. M.	S 68° 30' W	—26	.....	17 58,5	Calm	Fine and clear, star light	Max. easterly variation.
	2 0		68 30	—27	.....	17 58,5			
	2 20		68 30	—27					
	2 50		68 30	—27					
	3 10		68 30	—27	.....	18 1,2			
	3 55		68 30	—27	.....	18 3,9			
	5 10		70 50	—27	.....	18 00			
	5 50		70 10	—27					
	6 5		69 20	—27	.. ..	18 4,2			
	7 00		69 35	—27½	.. ..	18 2,3			
	7 30		69 20	—27½					
	8 00		68 20	—27½	.. ..	18 7,8			
	9 00		68 20	—27½	.. ..	18 19			
	9 40		68 40	—27½					
	10 30		69 00	—27½	.. To the left hand.	18 10,2			
	10 45		68 20	—25					
	11 00		68 30	—25	.....	18 9,3			
	11 40		69 00	—25	.....	.....	Easterly Light	Clear and fine	
	Noon		71 15	—25	.....	17 59,5	Easterly Light	Clear and fine	Max. westerly variation.
	0 30	P. M.	71 50	—23	.....	.....	
	0 35		72 00	—23					
	0 40		71 55	—23					
	0 45		72 00	—23					
	0 50		72 30	—23					
	1 00		72 30	—23	... ..	17 53,0			
	1 10		73 00	—23					
	1 20		73 30	—23					
	1 30		74 30	—22½					
	1 35		75 00	—22½					
	1 45		75 30	—22½					
	2 00		75 30	—22	.. ..	.....	Calm	Clear and fine	
	2 5		75 40	—22	.. ..	17 48			
	2 7		76 00	—22					
	2 15		76 15	—22	To the left hand.				
	2 20		76 30	—22					
	2 30		76 50	—22½					
	+ 2 40		77 00	—22½	.....	.....	.....	.....
	3 5		77 00	—22½	.....	17 52,7			
	3 27		76 55	—22½					

North end of Needle to the W. S. W.									
Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of needle.	Temp. Fahren. Instr.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.
1825. Mar. 14th	h. m.	P. M.	S 76° 20' W	—22½	.....	m. s. 17 54,7			
	4 26		76 15	—22½	.....	17 52,1			
	4 30		75 00	—23	.....	17 54,5			
	5 00		74 10	—23	.....	17 53,1	Calm	Clear and fine	
	5 30		74 00	—23½	.....	17 55,8			
	5 45		73 30	—23½	.....	17 58			
	6 00		73 00	—23½	.....	17 53,5			
	6 10		72 50	—24½	.....	17 56,3			
	6 30		72 40	—25½	.....	17 56,7	Calm	Clear and fine	
	7 12		72 40	—25	.....	17 57,7			
	7 50		72 50	—27	.....	17 59,3			
	9 25		72 50	—27	.....	18 3,2			
	10 20		72 50	—27	.....	18 0,7	.....	.....	Max. easterly var.
	11 50		72 50	—27	.....	17 58,2			
Mar. 15th	1 00	A. M.	72 40	—27	.....	17 55,8			
	1 32		72 30	—27	.....	17 59,8			
	1 56		72 15	—27	.....	17 58,6	N.wester Light	Hazy	
	2 50		72 00	—27	.....	17 57			
	3 30		71 40	—27	.....	17 57,8			
	3 55		71 30	—27	.....	17 59,5			
	4 25		71 30	—27	.....	17 57,1			
	5 6		70 50	—28	.....	17 55,2			
	5 30		70 50	—28	.....	17 52,2	N.wester Light	.....	Parhelion on each side of ☉.
	6 00		70 50	—27½	.....	17 50,1			
	6 50		70 50	—27½	.....	17 45,3	.....	.....	Max. westerly variation.
	7 15		70 50	—27½	.....	17 47,1			
	7 30		71 00	—27½	.....	17 50,1			
	7 10		71 00	—27	.....	17 50,3			
	9 42		71 00	—26	.....	17 53	N. W. Mod.	Hazy	Max. easterly variation.
	10 15		71 35	—25	.. To the left hand. ..				
	10 40		71 50	—24½	.. ..			
	11 14		72 20	—24	.. ..			
	Noon		73 10	—23	.. ..			
	0 35	P. M.	73 00	—23	.. ..			
	1 00		73 00	—23	.. ..			
	1 30		72 40	—23	.. ..			
	1 40		73 00	—23	.. ..			
	2 00		73 00	—22½	.....			
	2 30		73 10	—22½	.....			
	2 45		73 00	—22	.....			
	3 30		73 10	—22	.....			
	3 50		74 45	—22	.....			
	4 30		75 10	—22½	.....			
	+ 5 00		76 00	—22½	.....			
	5 15		76 00	—22½	.....			
	5 30		76 00	—23	.....			
	6 30		76 00	—23½	.....			
	7 15		76 00	—23½	.....			
	8 10		76 00	—23½	.....			
	9 00		75 55	—23½	.....			
	9 30		75 40	—23½	.....			

North end of Needle to the W. S. W.									
Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of Needle.	Temp. Fahr ^t .	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vib ^s .	Winds.	Weather.	Remarks, &c.
				Inst.					
1825.	h. m.		° ' "	°		m. s.			
Mar. 15th	10 10	P. M.	S 75 50 W	—24	.....	17 55			
	11 00		75 40	—24	.....	17 56,7			
	11 46		75 40	—24	.....	17 56,5			
Mar. 16th	1 20	A. M.	74 5	—24	.....	17 57,5			
	1 50		74 00	—24	.....	17 57,7	N Westy. Mod.	Hazy low down	
	2 30		73 10	—24½	.....			
	3 00		73 50	—24½	.....	18 00,3			
	3 45		73 40	—24½	.....	17 58			
	5 5		72 30	—24½	.....	18 0,2			
	5 50		72 10	—25	.....	17 58	Squally		
	6 20		72 10	—25	.....			
	7 10		72 00	—24½	.....	18 0,2			
	7 25		71 55	—24½	.....	18 0,6			
	9 00		71 40	—24½	.....	18 1,5			
	9 30		71 30	—24½	.....			
	10 00		71 30	—24	.....	18 1,5			
	10 30		71 20	—24	.....			
	11 00		71 30	—24	.....	18 1,8			
	11 20		71 40	—24	.....	.....	.....	.....	It will be seen that the <i>max. deflections</i> of this needle, took place about the same time that a decrease & increase of intensity in the directive force of the horizontal needle took place. <i>Max. westerly var.</i>
	11 30		71 30	—24	.....			
	Noon		71 30	—23	.....	17 56,6			
	0 5	P. M.	72 00	—23	.....			
	0 15		73 00	—23	.....			
	0 30		73 00	—23	.....			
	0 45		72 30	—23	.....			
	1 00		72 30	—23	.....	17 57			
	1 15		72 40	—23	.....			
	1 30		73 20	—23	.....			
	1 45		73 30	—23	.....			
	2 00		73 30	—23	.....	17 58,8			
	2 10		73 20	—23	.....	.....	.....	.....
	2 30		73 30	—23	.....	.....	N W Mod.	Hazy	
	2 56		73 30	—23	.....			
	3 15		73 30	—23	.....	17 54,2			
	3 40		74 20	—23	.....			
	5 15		75 10	—23½	.....	17 50,7			
	5 45		75 15	—23½	.....	17 46,6			
	+ 6 20		75 30	—23½	.....	17 45,3			
	6 45		75 30	—24	.....			
	7 15		75 30	—24	.....	17 46,9			
	7 55		74 40	—24	.....	17 48,8			
	9 5		73 30	—24½	.....	17 54,5			
	9 50		73 25	—24½	.....			
	10 20		73 00	—24½	.....	17 55,7			
	11 00		72 30	—24½	.....	17 55,8			
	11 30		72 00	—24½	.....	.....	Fresh NNW	Hazy	
	Mid ^t		72 00	—24½	.....	17 56,7			

North end of Needle to the S 85° W. The line of minimum daily variation.

The distance of the nearest end of each magnet placed to the South, from the centre of the compass-box, was, of that attracting the North end of the needle 18,6 inches, and of the other attracting the South end of the needle 27,15 inches : under this adjustment, the needle made one vibration in 10,2 seconds, so that the directive power now, was to the undiminished force as 0,31 to 1. nearly.

Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of needle.	Temp. Fahr ^{nt} . Instr.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.
1825. Mar. 23d	h. m.		0 1	0		m. s.			
	6 30	A. M.	S 83 30 W	—26	.....	18 2			Max.easterly var.
	7 10		83 30	—26	.....	18 2,2			took place at
	7 30		83 30	—26	.....				2 ^h 5 ^m A. M.
	7 55		83 30	—26	.....	18 1,5			
	+ 9 8		83 20	—26	.....	18 10,7			
	9 30		83 30	—26	.....			
	10 10		83 30	—23	.....	18 10,5			
	10 30		83 30	—22	.....			
	11 18		83 30	—22	.....	18 9,3			
	11 50		83 30	—21	.....			
	0 4	P. M.	83 40	—21	.....	18 3			
	0 45		83 50	—20 ¹ / ₂	.....			
	1 5		84 20	—20 ¹ / ₂	.....	17 52,8			
	2 5		84 20	—20	.....	17 53,9			Max.westerly var.
	2 45		85 00	—19 ¹ / ₂	.....			
	3 5		85 00	—19 ¹ / ₂	.....	17 56,5			
	3 25		85 00	—19 ¹ / ₂	.....			
	3 55		85 00	—19 ¹ / ₂	.....	17 58,4			
	4 45		85 5	—19 ¹ / ₂	.....	17 55,6			
	5 20		85 00	—21	.....			
	6 00		85 00	—22	.....	17 50,5			
	6 20		85 00	—23	.....			
	7 00		85 10	—23 ¹ / ₂	.....	18 1,8			
	7 35		85 20	—24	.....			
	7 55		85 20	—24	.....	17 56,7			
	9 00		86 00	—24	.....	18 0,2			
	9 15		86 20	—24	.....			
	9 40		86 00	—24	.....	17 58,5			
	11 00		86 15	—25	.....	17 59			
	Midn ^r		85 50	—26 ¹ / ₂	.....	17 59			
Mar. 24th	1 00	A. M.	85 40	—26 ¹ / ₂	.....	18 00,8			
	1 30		84 40	—26 ¹ / ₂	.....		Calm	Clear and fine	Max.easterly var.
	2 00		85 00	—27	..	18 2,5			
	2 30		85 00	—27	..				
	2 40		84 00	—27	..				
	2 50		83 50	—26 ¹ / ₂	..	18 2,5	Easterly Light	Ditto	
	3 20		83 40	—27	..				
	3 55		83 40	—27	..	12 4,1			
	6 00		83 40	—27	..	18 5,8			
	6 57		83 50	—27	.. To the right hand.	17 54,7	Calm	Clear and fine	

North end of needle to the S. 85° W. The line of min. daily variation.

Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of needle.	Temp. Fahren. Instr.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.
1825. Mar. 24th	h. m.	A. M.	S 83° 50' W	°	..	m. s.			
	7 50			-27	..	18 2			
	9 6		83 50	-26	..	18 00			
	9 30		83 35	-26	..	18 0,7	.....	.....	Max. westerly var.
	9 55		83 35	-26½	..	18 6,9			
	+ 10 20		83 30	-26	..	.....	
	10 50		83 30	-24½	..				
	11 00		83 40	-24½	..	17 56			
	11 30		84 00	-23½	..				
	Noon		84 20	-23½	.....	17 49,1			
	0 15	P. M.	84 30	-23½					
	0 35		84 40	-22½					
	1 40		84 40	-22	.....	17 55,7	Easterly Light	Fine	
	2 10		84 55	-22					
	2 50		85 00	-22	.....	17 57			
	3 10		85 00	-22					
	3 42		Ditto	-22					
	4 11		.....	-22	.....	17 59,5			
	5 00		.....	-23	.....	17 54,5			
	5 50		.....	-24	.....	17 52,2			
	7 30		.....	-24					
	8 00		.....	-25	.....	17 55			
	8 30		.....	-25	.....	17 50,2			
	8 52		.....	-26	.....	17 53,2			
	9 30		.....	-26½					
	9 55		.....	-27	.....	17 58,9			
	10 15		.....	-27					
	10 30		.....	-27½	.....	.....	Ditto	Ditto	
	11 10		.....	-27½	.....	18 1,4			
	Midn't		.....	-27	.....	18 1,1			
Mar. 25th	0 30	A. M.	.....	-27	.....			
	1 6		.....	-27	.....	18 0,8	.....	.....	Max. easterly var.
	1 45		.....	-27	.....	17 55,8			
	2 10		.....	-27					
	2 42		.....	-27	.....	17 57,5			
	3 32		.....	-27					
	4 00		.....	-27	.....	17 59,5			
	4 28		.....	-27					
	5 40		.....	-29½	.....	17 57,2			
	6 57		.....	-29	.....	17 54,8			
	8 2		.....	-28	.....	17 57,9			
	8 50		.....	-28	.....	17 58,5			
	9 12		.....	-28	.....	17 59,5			
	9 50		.....	-28	.....	.....	Light easterly winds and clear weather.		Max. westerly var.
	10 14		.....	-26½	..	18 0,8			
	11 00		.....	-26½	..	17 58,3			
	11 30		.....	-26	..				
	Noon		.....	-26	..	17 59,3			
	0 30	P. M.	.....	-26	..				
	0 55		.....	-26	..	17 59,8			
	1 30		.....	-25	Line of min. effect.				

North end of needle to the S 85° W. The line of min. daily variation.									
Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of needle.	Temp. Fahrén. Instr.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.
1825.	h. m.			o		m. s.			
Mar. 25th	1 55	P. M.	S 85° 00' W	—24	.....	17 54,9			
	2 45		.....	—23½	.....	17 55,7			
	3 15		.....	—23½	.....	.....	.....	.....	Max. easterly var.
	3 50		.....	—23½	.....	17 56,7			
	4 50		.....	—23½	.....	17 54,3			
	6 00		.....	—26	.....	17 56,9			
	6 50		.....	—26	.....	17 56,2			
	7 36		.....	—26	.....			
	8 30		.....	—26½	.....	17 57			
	9 00		.....	—26½	.....	17 57,5			
	10 00		.....	—26½	.....	17 56,3			
	11 00		.....	—27	.....	17 57,8			
	11 50		.....	—27	.....	17 58,3			
Mar. 26th	1 7	A. M.	.....	—26½	.....	17 57,7	N. W.	Hazy	
	1 50		.....	—26	.....	17 58,2	Fresh		
	2 15		.....	—26	.....			
	3 00		.....	—26	.....	17 59,7			
	4 00		.....	—26	.....	17 59,4			
	4 50		.....	—27	.....	18 2,0	.....	Squally	
	6 00		.....	—26	.....	18 3,2			
	7 00		.....	—26	.....	18 3,7			
	7 40		.....	—26	.....	18 5,0			
	9 00		.....	—24	.....			
	10 00		.....	—24	.....	18 7,5			
	10 25		.....	—24	.....	.....	.....	.....	Max. westerly var.
	11 2		.....	—23	.....	17 59			
	11 30		.....	—23	.....			
	Noon		No perceptible motion.	—21½	Line of minimum effect.	17 58,8			
	0 30	P. M.	.....	—22½	.....		North Mod.	Hazy	
	1 10		.....	—22	.....	17 52,5			
	1 50		.....	—22	.....	17 52,3			
	2 55		.....	—21½	.....	17 57,6			
	3 50		.....	—22	.....	17 58			
	5 15		.....	—22½	.....	17 53,3	North Squally		
	5 50		.....	—22½	.....			
	6 20		.....	—22½	.....	17 54,5			
	7 10		.....	—23	.....	17 57,4			
	7 50		.....	—23	.....	17 56,7			
	9 5		.....	—23	.....	17 58,2			
	9 50		.....	—23	.....	17 57,2			
	10 50		.....	—23	.....	17 59,5	North Fresh	Clear	
Mar. 27th	11 47	A. M.	.....	—23	.....	17 59,8			
	1 00		.....	—23	.....	18 1,0	.....	Hazy	
	1 30		.....	—23	.....			
	1 55		.....	—23	.....	18 3			
	2 45		.....	—23	.....			
	3 50		.....	—23	.....	18 4,2			
	5 15		.....	—23	.....	17 58,9	.....	.....	Max. easterly var.
	5 50		.....	—23	.....	18 00	Ditto	Clear	
	6 20		.....	—22	.....			

North end of needle to the S. 85° W. The line of min. daily variation.

Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of needle.	Temp. Fahren ^t .	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.
				Instr.					
Mar. 27th	h. m.	A. M.	S 85° 00' W	°	Line of min. effect.	m. s.	Hazy with snow	
	7 10			—22		17 59,3			
	9 00			—21		17 57,3			
	9 30			—21		18 5,5			
	10 10			—21		18 4,7			
	10 45			—20		18 4,2			
	0 10			—20		18 3,7			
	1 30			—18		17 57,2			
	2 10			—18		17 53,7			
	3 15			—18½		17 55,5			
	3 50			—18½		17 56,5			
	7 00	P. M.	85 30	—18½	17 57,8	Max. westerly var.
	9 12			—20		17 55,3			
	9 35			—20		.....		
	10 2			—20		17 56			
	10 35			—21		.....		
	11 10			—21		17 58,3			
	11 42			—21		.....		
	Midn ^t			—22		17 59			
Mar. 28th	1 8	A. M.	85 50	—22½	18 1,6	Westerly Light	Hazy	Max. easterly var.
	1 50			—22½		18 2,8			
	2 30			—22½		.....		
	3 5			—22½		18 7,9			
	3 52			—22½		18 6,0			
	6 30			—23		17 58,5			
	7 00			—23		18 7,2			
	7 30			—23		17 55,7			
	9 10			—22		18 3,7			
	9 30			—21½		.....		
	9 56			—21½		18 10,8			
	10 30			—20		.....		
	11 00	P. M.	81 40	—20	To the right hand.	18 10,4	Easterly Light	Clear and fine	
	+ 11 30			—20		18 4,4			
	1 00			—18		18 1			
	1 15			—18		.....		
	1 30			—18		.....		
	1 40			—18		.....		
	2 00			—18		18 2,5			
	2 30			—18		.....		
	2 50			—18		17 56,2			
	3 22			—18		.....		
	3 45			—18		.....		
	5 30			—18		17 51,5			
	6 00			—18		.....		
	6 30			—19½		17 53,3			
	7 00			—20		.....		
	9 5			—20½		17 52,8	Ditto	Hazy with snow	Max. easterly var.
	9 50			—20½		17 56,3			
	10 20			—20½		.....		
	10 50			—20½		17 57,8			

North end of Needle to the S. 85° W. The line of min. daily variation.									
Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of needle.	Temp. Fahrenheit. Instr.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.
Mar. 28th	h. m.			°		m. s.			
	11 15	P. M.	S 86 10 W	—20½	.....	17 57,5			
	11 52		86 00	—21	.....	17 58,8			
Mar. 29th	1 7	A. M.	86 10	—21	.....	17 59,3	East Light	Hazy	
	1 52		86 20	—21	.....	18 0,5			
	2 12		86 10	—21					
	2 50		86 10	—22	.....	18 2,3			
	3 45		86 10	—22					
	4 12		86 10	—22		18 3,5			
	5 00		85 45	—23	.....	18 3,3			
	5 30		84 30	—23	.....			
	7 00		84 50	—23	.....	17 57,5			
	7 30		84 50	—23	.....	18 4,7			
	9 10		84 40	—21	.....	18 0,8	.....	.....	Halo and Parhelion on each side of ☉. Max. westerly var.
	9 46		84 30	—21	.....	17 57,5			
	10 12		84 20	—21	.....	17 51,2	Ditto	Ditto	
	11 5		85 10	—20	.....	18 14,3			
	11 40		84 40	—19					
	0 7	P. M.	84 10	—19	.....	18 18			
	+ 1 2		84 00	—18½	.....	17 46,7			
	1 40		84 00	—18	.....	.....	.....	.....	Max. easterly var.
	2 15		84 10	—17½	.....	17 48,5			
	2 50		84 40	—17½					
	3 15		85 00	—17½	.....	17 48			
	3 55		85 00	—17	.....	17 56,2			
	6 00		85 15	—19½	.....	17 55,5	Easterly Light	Clear and fine	
	7 00		85 30	—21	.....	17 53			
	7 30		85 30	—21					
	8 00		85 40	—22	.....	17 59,3			
	8 30		85 40	—22					
	8 50		85 40	—22					
	9 12		86 30	—22	.....	17 58,5			
	10 14		86 30	—22	.....	17 59,7			
	10 46		86 20	—22					
	11 20		86 20	—22	.....	18 1,3			
	Midnt		86 00	—22	.....	18 2,8			
Mar. 30th	0 8	A. M.	85 10	—22	.....	.....	Northerly North Light	Clear Clear	
	0 10		84 25	—22					
	1 20		84 25	—22	.....	18 0,3			
	2 35		82 40	—22	.....	18 9,3			
	3 10		82 30	—22½	.....	18 14,8			
	3 58		77 30	—23	.....	18 31,3			
	+ 5 00		75 00	—23½	.....	18 24,2	.....	.....
	6 00		78 28	—23½	.....	18 11,5			
	6 10		79 00	—23½					
	6 40		78 30	—23½					
	7 00		78 00	—23½	.....	18 13,5	Easterly Light	Clear and fine	
	7 15		79 00	—23½					
	7 20		80 00	—23½					
	7 30		81 00	—23					
	8 00		81 00	—23	.....	18 11,4			

North end of Needle to the S 85° W. The line of min. daily variation.									
Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of Needle.	Temp. Fahren. Instr.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.
1825. Mar. 30th	h. m.	A. M.	° ' W	°	.....	m. s.	.....	Hazy	Max. westerly var.
	10 00		83 30	—21		18 10,3			
	10 10		85 00	—21					
	10 30		80 20	—21					
	10 50		83 30	—20½	.....	17 46,7			
	11 20		88 40	—19					
	11 40		88 00	—19					
	Noon		85 00	—19	.....	17 54			
	0 50	P. M.	88 00	—19					
	1 10		88 10	—18	.....	18 11,3			
	1 48		88 00	—18					
	2 36		87 40	—17	.....	17 57,2			
	3 00		89 10	—17	.....	17 57			
	5 10		88 30	—18½	.....	17 58,1			
	5 45		87 40	—19	.....	17 53,7			
	6 15		87 10	—20					
	6 50		86 50	—21	.....	17 54,1	Easterly moderate	Hazy	
	7 20		86 40	—21					
	8 00		86 40	—21	.....	17 58,4			
	8 30		86 40	—21					
	8 45		86 00	—21					
	9 12		86 00	—22	.....	17 55,2			
	9 42		86 20	—22					
	10 15		86 30	—22	.....	17 57,2			
	10 50		86 30	—22					
	11 50		86 30	—22					
	Midnt		86 30	—22		17 57,7	Ditto	Ditto	
Mar. 31st	5 10	A. M.	81 00	—24	.....	18 0,7	Easterly Fresh	Hazy	Max. easterly var. at 1 ^h 3 ^m A. M.
	5 50		81 00	—24	.....	.....	
	6 20		80 40	—24	.. ..	18 9,4			
	+ 6 55		80 30	—24					
	7 15		81 00	—24	.. ..	18 4,4			
	8 00		83 20	—24	.. ..	17 55,8			
	9 6		83 50	—23	.. ..	18 3	Ditto Light	Cloudy	
	10 0		84 30	—22	.. ..	18 4,3			
	11 5		83 10	—21	.. ..	18 9,2			
	11 36		83 00	—21					
	Noon		85 50	—21	.. ..	18 1	.....	.....	Max. westerly var.
	0 30	P. M.	86 30	—21	.....	.....	Easterly moderate		
	1 10		86 20	—20	.....	17 58,8			
	1 50		86 20	—20					
	2 15		86 20	—19½	.....	17 53,7			
	2 50		86 20	—19½					
	3 12		86 20	—19½	.....	17 58,5			
	3 56		86 20	—19½	.....	17 58,2			
	8 00		86 20	—23	.....	17 56,5	Easterly	Very Clear	
	9 00		86 30	—24	.....	17 57,7			
	9 56		84 55	—24	.....	17 55,5	.....	.....	D. on south meridian 19° altitude.
	10 30		84 55	—24½					
	11 00		85 00	—25	.....	17 56,5			
	Midnt		85 15	—25	.....	18 1			

North end of Needle to the S 85° W. The line of min. daily variation.

Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of Needle.	Temp. Fahren. Instr.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.
1825. April 1st	h. m.		o / 20 W	o		m. s.			
	1 15	A. M.	84 20	-25½	.....	18 3,5	Easterly moderate	Clear	
	1 52		84 30	-25½	.....	.....	
	2 18		84 20	-26	.....	18 9,7			
	2 50		84 00	-26	.....	18 15,5			
	3 20		84 00	-26½	.....		Squally	.....	Max. easterly var.
	3 56		84 00	-26½	.....	18 4	Moderate	Fine and Clear	
	6 00		82 30	-27	.....	18 10,8	easterly		
	6 15		82 00	-27					
	6 30		80 30	-27					
	6 45		79 30	-27					
	7 00		79 20	-27	.....	18 15			
	9 10		78 50	-24	.....	18 23,3			
	+ 9 50		78 00	-23					
	10 15		81 30	-23	.....	18 9			
	10 45		83 20	-23					
	11 6		87 10	-23	Irregular. ..	17 55,3	.....	.....	The intervals of 10 vib* of the horizontal needle were rapidly decreasing between 11 ^h and 12 ^h A.M.
	11 20		90 00	-22					
	11 32		90 00	-22					
	11 45		87 30	-21	Irregular. ..	.....	Easterly light	Clear and Fine	
	0 8	P. M.	87 20	-20½	.....	17 49,8			
	1 00		83 30	-20	.....	17 49,7			
	1 49		90 00	-19	.....	17 43,8	.....	.....	Max. westerly var.
	2 30		89 20	-19					
	3 12		88 15	-19	.....	17 55,7			
	4 00		87 30	-19	.....	17 54,3			
	5 00		88 50	-21	.....	17 44			
	6 00		87 00	-21	.....	17 55			
	6 30		85 00	-21					
	7 30		87 40	-23	.....	17 45			
	8 00		88 00	-23	.....	17 52,3			
	- 9 6		91 50	-23½	.....	17 39,3			
	10 40		89 30	-23½	.....	17 46,1			
	11 5		86 20	-23½	.....	17 52,9	Easterly light	Clear and Fine	Max. easterly var.
	11 52		85 30	-25	.....	17 59,1	Easterly moderate	Ditto	
Apr. 2nd	1 00	A. M.	84 30	-26	.....	18 5,8			
	1 32		83 50	-26					
	2 10		83 20	-26	.....	18 4,7			
	2 42		82 50	-27					
	3 5		82 00	-27	.....	18 4,5			
	+ 4 2		81 40	-27	.....	18 8,8			
	5 00		82 00	-27	.....	18 57,3			
	6 00		82 10	-26½	.....	17 53,5			
	8 00		—	-26½	—	18 17,5			
	9 10		82 40	-24	.....	18 0,7			
	9 47		83 00	-24	.....	.....	Ditto	Hazy	
	10 12		83 30	-24	.....	17 57,5			
	11 5		84 20	-23	.....	17 56			
	11 10		85 00	-23	.....			
	11 45		85 00	-23	.....	17 33,8	Squally	.....	Max. westerly var.

North end of Needle to the S 85° W. The line of min. daily variation.									
Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of Needle.	Temp. Fahren ^t . Instr.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.
1825. April 2d	h. m. 1 4 1 30 1 50 2 15 2 50 3 12 3 55 5 6 6 00 7 5 9 5 10 2 10 50 Midn ^t	P. M.	S 86 40 W 87 30 88 00 88 00 88 00 88 00 87 20 86 30 84 50 84 50 85 45 86 10 86 10 86 10	0 -23 -22½ -22½ -22½ -22 -22 -23 -23 -23½ -23½ -23 -23 -23 -24	.....	m. s. 17 46 17 47.4 17 53.6 17 56 17 53.5 17 59.8 17 54.7 17 53.7 17 56.5 17 57 17 58	Easterly Light	Hazy to the westward.	
April 3d	1 12 1 55 2 35 3 10 3 50 + 9 00 9 30 10 5 10 48 11 22 0 10 0 13 0 15 1 6 1 40 3 00 3 30 5 2 5 30 6 00 6 25 6 50 7 20 7 54 9 10 10 2 11 15 Midn ^t	A. M.	84 00 83 30 83 30 83 20 82 30 77 20 79 00 82 30 81 10 80 10 82 30 87 00 87 24 90 30 91 5 86 55 86 00 86 00 86 30 87 00 87 00 87 00 86 10 86 30 86 20 86 20 86 20	-24 -24 -24½ -24½ -24½ -23 -23 -22 -22 -21½ -21 -21 -21 -20 -19 -18 -19 -19½ -19½ -20 -20 -20½ -21 -21 -21 -22 -22	..... To the left hand.	18 5.1 18 1.2 18 5.2 18 11.3 18 11 18 4.3 17 57.5 17 45.7 17 56.4 18 00.5 17 54.3 17 51.9 17 54.3 17 55.1 17 55.5 17 57.3 17 58.7 17 58.6	Ditto	Hazy	Max. easterly var.
Apr. 4th	5 20 5 50 6 15 6 52 7 00 7 10	A. M.	85 00 85 00 84 30 84 00 84 00 83 00	-23 -23 -23 -23 -23 -23	.....	18 0.4 18 2.7	Ditto	Hazy	Max. easterly var.

North end of Needle to the S 85° W. The line of minimum daily variation.

Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of Needle.	Temp. Fahr. Instr.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.
1825. April 4th	h. m.					m. s.			
	+ 9 10	A. M.	S 82 00 W	—21	... .	18 12,3			
	9 52		83 40	—21	.. .				
	10 15		84 50	—21	.. .	18 1,5			
	11 5		85 30	—21	.. .	18 1,5			
	0 5	P. M.	85 40	—19	.. .	18 2	....	....	Max.westerly var.
	— 1 10		91 00	—18	.. .	17 43,5			
	1 20		91 00	—18	To the left hand.				
	1 50		89 10	—18					
	2 10		89 00	—18	.....	17 45,4	....	....	Max.easterly var.
	2 45		89 00	—18					
	3 8		86 50	—18	.....	17 58,1			
	3 25		86 50	—17	.....	.....	Easterly light	Clear and fine.	
	3 54		86 10	—17	.....	18 2,7			
	5 00		86 10	—18	.....	18 00			
	5 30		86 30	—18					
	6 00		86 30	—19½	.....	17 55			
	7 00		86 30	—20	.....	17 54			
	9 00		86 30	—22	.....	17 54			
	9 55		86 30	—23					
	10 15		86 25	—23	.....	17 56,2			
	11 00		86 25	—23					
	11 16		86 25	—23	.....	17 57,4			
April 5th	11 50		86 00	—23	.....	18 0,3			
	1 7	A. M.	86 00	—24	.....	18 2,3			
	2 5		85 40	—24	.....	18 2,8			
	3 0		85 30	—25	.....	18 3,3	Easterly light	Clear and fine.	
	4 2		85 00	—25	.....	18 7,5			
	5 30		85 00	—25	.....	17 58			

North end of Needle to the N 85° E.

Both magnets were placed to the south of the compass; the distance from the centre of the box, to the nearest end of the magnet, attracting the north end of the needle, was 18,98 inches, and to the nearest end of the other, attracting the south end of the needle, 27 inches. The needle now made 1 vibration in 9,5 seconds, the directive force being reduced in the ratio of 0,35 to 1 nearly.

April 5th	6 00	A. M.	N 85 0 E	—25	.....	17 59,5	Easterly light	Clear and fine.	☉ rising ENE. (true.)
	7 00		85 10	—25	.....	18 6,2			
	7 30		84 30	—25	.....	18 1,5			
	8 56		84 00	—22	.....	18 1,8			
	9 15		83 50	—22½	.. .	18 1			
	9 30		83 20	—21½	.. .	.....	....	....	Max.westerly var.
	10 00		82 30	—21½	.. .	18 0,2			
	10 15		84 30	—21					
	10 50		86 00	—20					
	11 00		85 30	—20	.. .	18 6,4			
	11 30		84 30	—19	To the right hand.				

North end of Needle to the N 85° E.									
Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of Needle.	Temp. Fahren. Instr.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.
1825. April 5th	h. m.	A. M.	N 83 00 E	0		m. s.			
	11 35			—19					
	11 40		82 00	—19					
	11 50		81 00	—19					
	11 55		80 30	—19	.....	.....	.....	Slight fall of small snow.	
	Noon		80 00	—19	.....	17 47,6			
	+ 0 45	P. M.	79 50	—18					
	1 00		79 50	—18	.....	17 51,6			
	1 30		80 00	—18					
	2 00		80 00	—18	.....	17 56			
	2 30		80 30	—18½					
	2 40		79 50	—17	.....	17 55,2			
	3 30		80 50	—17					
	3 58		81 50	—17	.....	17 57,1			
	5 30		82 00	—20	.....	17 55,8			
	6 00		81 50	—21	.....	17 55			
	7 00		81 50	—21	.....	17 50			
	9 00		81 40	—23	.....	18 2,2			
	9 45		81 40	—23					
	10 20		81 40	—23½	.....	18 2,9			
	10 50		81 50	—23					
	11 15		82 10	—24	.....	18 00			
April 6th	11 54	A. M.	82 40	—24	.....	18 1,6	.....	.....	Max. easterly variation.
	1 5		83 00	—25	.....	18 6,8	Easterly light.	Clear and fine	
	1 55		83 25	—25					
	2 5		83 50	—25	.....	18 6,2			
	2 7		84 00	—25					
	3 0		84 10	—26	.....	18 9,3			
	3 50		84 25	—26	.. To the left hand.	17 54,4			
	5 6		84 35	—26	..	18 3			
	5 58		85 10	—26	..	18 7,8	ENE mod. & clear		
	7 10		85 30	—26	..	18 9,7			
	7 15		87 00	—26					
	7 30		87 30	—26	.. To the left hand.	.....	Easterly light		
	7 55		87 30	—25	..	18 15,5			
	9 00		87 30	—23½	.....	18 11,8			
	9 30		87 20	—23½					
	10 00		87 10	—22	.....	18 9,2	.....	.....	Max. westerly variation.
	10 30		87 30	—22					
	11 00		87 30	—22	.....	18 2,6			
	11 35		87 20	—21					
	Noon		87 20	—20	.....	18 9			
	0 30	P. M.	87 10	—19					
	0 40		85 40	—19					
	1 00		84 50	—19½	.....	17 56,1			
	1 30		84 50	—19½					
	1 55		84 40	—19½	.....	17 59			
	2 15		84 40	—19½	.....	.....	Easterly light	Clear and fine	
	2 50		84 40	—19½					
	3 15		84 30	—19½	.....	18 0,4	.....	.....	Max. easterly variation.
	3 56		84 10	—19½	.....	18 1,7			

North end of Needle to the N 85° E.									
Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of Needle.	Temp. Fahren. Instr.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.
1825. April 6th	h. m. 5 10 6 6 6 50 7 48 + 9 00 10 00 10 30 11 00 11 30	P. M.	N 84 10' E	—20 —21 —21 —22 —22 —23 —24 —24 —24	..... ..... ..... ..... ..... ..... ..... ..... .....	m. s. 18 1,8 17 56 17 56,7 17 55,7 18 3,3 18 0,3			
April 7th	Mid. 1 10 1 50 2 30 3 3 3 50 5 00 6 00 7 00 7 55 9 10 9 50 10 11 11 2 11 51 Noon	A. M.	83 30 83 30 83 30 83 30 84 00 84 20 84 15 84 35 84 55 84 30 84 30 84 30 84 30 84 30 84 30	—24½ —25 —25 —25 —25 —25 —25 —24 —23 —23 —22 —21 —20 —19	..... Irregular.	18 2,5 18 1,1 18 4,6 17 58,7 17 58,5 17 56,6 18 0,7 18 6,1 18 1,2 18 5 18 6,5 18 7,2	Easterly light Easterly light	Clear and fine. Clear and fine.	
	0 30 1 00 1 30 2 00 2 30 3 00 5 00 5 30 + 6 10 6 30 7 10 7 30 7 52 7 55 9 10 10 6 11 10 11 56	P. M.	84 30 84 30 82 20 82 00 81 30 81 30 81 25 81 10 81 5 81 5 81 5 81 10 81 35 81 40 81 50 82 00 82 20 82 15	—18½ —17½ —16½ —16½ —16½ —16½ —17 —18 —19 —19 —20 —20 —20 —20 —21 —21 —22	..... ..... ..... ..... ..... ..... ..... ..... ..... ..... ..... ..... ..... ..... ..... ..... ..... .....	18 8 17 55,2 17 53,5 17 57 17 53 17 52,8 17 52,6 17 56,6 18 1,8 17 59,7 18 1,5 18 1,5	Ditto Ditto	Ditto Ditto	
April 8th	1 00 1 10 1 40 2 10	A. M.	83 30 84 30 84 30 85 00	—22 —22 —22½ —22	..... ..... ..... .....	17 59 18 9	Easterly light	Clear and fine	Max. westerly var. Max. easterly var.

North end of Needle to the NE.

The magnets were now placed to the north and south of the needle, with their axes slightly inclined to the magnetic meridian; the north magnet had its north pole towards the compass-box, at the distance of 29,1 inches from its centre, and the south magnet had its south pole towards the compass-box, at the distance of 30,1 inches from its centre: the time in which the needle now performed 1 vibration, was 14,4 seconds; so that the directive force was reduced in the ratio of 0,15 to 1.

Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of Needle.	Temp. Fahrenheit. Instr.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.
1825. April 8th	h. m.		° /	°.		m. s.			
	5 10	A. M.	N 45 30 E	—23	18 1,3	East Fresh	Clear and Fine	It will be seen that, at the time of the greatest <i>westerly</i> var. an increase of directive power in the horizontal needle took place, which accounts for the great expression of 50° for the daily variation.
	5 55		45 20	—22	.....	18 9,2		
	6 30		45 20	—22	.....	18 12,3		
	6 55		45 20	—22	.....	18 3,4		
	7 20		45 20	—21½	.....	17 58,8		
	7 50		44 10	—21½	.....	18 22,8		
	8 00		43 50	—21½	.....	18 6		
	9 26		42 20	—20	.....	17 51,8		
	9 28		42 00	—20	.....	17 56,2		
	10 10		41 50	—20	.....	17 50,5		
	10 30		41 30	—20	.....	17 44		
	11 10		41 10	—19	.....	17 53		
	11 30		41 00	—18½	.....	17 43,5		
	Noon		36 10	—18½	.....	17 37		
	0 15	P. M.	35 00	—18½	.....	17 41,5		
	0 30		29 00	—18½	.....	17 34,7		
	+ 1 10		1 30	—17	.....	17 44,6		
	2 00		10 10	—17	17 45,4			<i>Max. west. var.</i>
	2 50		16 30	—17	.....	.....	
	3 10		17 00	—17	.....	.....	
	3 47		17 40	—17	.....	.....	
	5 5		25 30	—17	.....	.....	
	5 30		25 30	—17	.....	.....	
	6 00		27 30	—17	.....	.....	
	6 20		27 30	—18	.....	.....	
	6 35		32 00	—19	.....	.....	
	7 10		33 30	—19	.....	.....	
	8 00		37 00	—19			<i>Max. east. var.</i>
	9 30		40 00	—20	.....	.....	
	10 00		40 00	—20	.....	.....	
	10 35		40 00	—20	.....	.....	
	11 12		45 10	—20½	.....	.....	
	—Midn ^t		51 30	—20½	Easterly Light	Hazy	

North end of Needle to the N E.

The situation of the magnets, in this case, was the same as in the preceding observations at N.E; except that their ends nearest to the needle were 29,7 inches from the centre of the compass-box: the needle making 1 vibration in 12 seconds, the directive force was reduced in the ratio of 0,22 to 1.

Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of Needle.	Temp. Fahrent. Instr.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.
1825. Apr. 9th	h. m.		^o /	^o		m. s.			
	1 00	A. M.	N 54 00 E	—20 $\frac{1}{2}$	.....	18 4	Easterly moderate	Hazy	
	2 00		54 00	—20 $\frac{1}{2}$	.....	17 7,3			
	3 12		53 50	—20 $\frac{1}{2}$	.....	18 8,2			
	3 48		53 50	—21					
	4 8		53 30	—20	.....	18 7,5			
	5 00		53 00	—20	.....	18 12			
	6 00		52 00	—20	.....	18 8			
	6 30		51 30	—20					
	7 00		51 00	—20	.....	18 8,2			
	7 30		50 40	—20	.....	18 7,5			
	9 00		50 20	—18 $\frac{1}{2}$	.....	18 9,7			
	9 35		44 50	—18 $\frac{1}{2}$	.....	.....	Ditto	Overcast	
	9 50		44 10	—18 $\frac{1}{2}$	.....	18 9,2			
	10 15		44 10	—18					
	10 45		44 00	—17 $\frac{1}{2}$					
	11 10		44 00	—17	.. the right hand.	18 16,1			
	11 45		43 40	—17					
	12 8	P. M.	43 00	—16 $\frac{1}{2}$	.. To the right hand.	18 9,7			
	1 5		38 55	—16	..	17 58,5	.....	.....	Max. westerly var.
	1 30		38 40	—16					
	2 10		38 30	—16	.....	17 53,9			
	2 30		38 15	—15					
	3 10		38 00	—16	.....	17 47,8			
	+ 3 50		34 00	—16	.....	17 41,4			
	5 00		34 00	—17	.....	17 41,5			
	6 00		34 00	—17	.....	17 55			
	6 30		34 00	—17					
	7 00		34 00	—17	.....	17 43			
	8 00		34 00	—17	.....	17 50,2			
	9 10		34 20	—18 $\frac{1}{2}$	.....	17 47,2			
	9 45		35 20	—19					
	10 5		35 30	—19	.....	17 54,4	Easterly moderate	Hazy	
	10 35		35 50	—19 $\frac{1}{2}$	.....			
	11 7		36 00	—19	.....	17 55,4			
	11 34		36 30	—19					
	11 56		37 30	—19	.....	17 56,5			

North end of Needle to the N E.									
Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of Needle.	Temp. Fahrent.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibr. tions.	Winds.	Weather.	Remarks, &c.
				Instr.					
1825. Apr. 10th	h. m.		° ,	°		m. s.			
	1 13	A. M.	N 42 50 E	—19	.....	17 57,5	Easterly moderate	Hazy	
	1 15		44 50	—19					
	1 16		45 30	—19					
	1 17		46 00	—19					
	1 58		47 00	—18½					
	2 11		47 30	—18½	.....	18 3,8			
	2 55		51 40	—18	.....	18 11	.....	.....	Max. easterly var.
	3 50		53 00	—18	.....	18 4,4			
	5 10		52 20	—18	.....	18 14,5			
	6 4		52 20	—18	.....	18 13,3			
	7 2		52 40	—17	.....	18 17,7			
	7 50		52 20	—17					
	8 10		52 20	—16	.. ..	18 20,2			
	9 00		52 00	—16	.. ..	18 7,2	Easterly Fresh	Thick hazy weather with snow drift.	
	10 00		51 00	—16	.. ..	18 10			
	10 30		46 30	—15½					
	11 00		41 00	—15	.. ..	17 53,5			
	11 30		40 00	—14½	.. ..			
	+ Noon		38 40	—14½	.. ..	17 58,5			
	1 00	P. M.	39 00	—14	.. ..	17 55,6			
	1 32		40 20	—14					
	2 00		40 20	—14	.....	18 3,5	.....	.....	Max. westerly var.
	2 32		40 20	—13½	.....	.....	E S E Strong	Much snow drift and thick weather.	
	3 00		39 40	—13½	.....	17 37,9			
	3 34		39 00	—13½					
	3 55		39 00	—13½	.....	17 48,2			
	5 7		39 00	—13	.....	17 56,8			
	6 6		39 10	—13	.....	17 59,2			
	7 5		39 10	—13	.....	17 58,7	E S E strong gales with heavy drift of snow.		
	7 46		39 00	—13	.....	18 0,5			
<p>The direction of the Needle was not registered after 7^h 46^m P. M. in consequence of the severity of the weather : Gale of wind from eastward, and much snow drift.</p>									

North end of Needle to the S. E.

The needle was held in equilibrio at this point by two bar magnets; one to the North, with its nearest end from the centre of the compass 26,3 inches; the other to the South, having its nearest end from the centre of the compass 26,6 inches; the axis of each magnet was slightly inclined to the meridian, and the needle under their influence made 1 vibration in $11, \frac{1}{2}$ seconds, the directive power being reduced in the ratio of 0,24 to 1 nearly.

Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of needle.	Temp. Fahren.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.
1825.									
Apr. 12th	h. m.		[°] [']	[°]		m. s.			
	6 30	A. M.	44 00 E	+ 0	.....	18 17,4	E S E	Hazy	Max. easterly var. took place at 0 ^h 3 ^m A. M.
	7 00		43 30	+ 3 $\frac{1}{2}$			Fresh		
	8 00		43 10	+ 4	.....	18 20,3			
	9 32		43 00	+ 5	.....	18 16,5			
	10 15		42 55	+ 6	.....	18 19,6			
	10 32		42 30	+ 6					
	11 7		42 30	+ 6	.. To the left hand.	18 12,2			
	11 30		42 10	+ 7	.....	.....	East moderate	Snow falling	
	11 32		42 00	+ 7	.....			
	11 33		41 55	+ 7					
	0 5	P. M.	41 55	+ 7	.. To the left hand.	18 12,8			
	1 10		42 00	+ 6	.....	18 10,3	.....	.....	Max. westerly var.
	2 7		42 00	+ 5	.....	18 8,7			
	+ 3 8		41 50	+ 5	.....	18 8,2	Squally	Much drift	
	3 57		41 50	+ 5	.....	18 6,2			
	5 00		42 10	+ 5	.....	17 59,7			
	5 30		42 40	+ 5	.....			
	6 00		42 40	+ 5	.....	18 1,7			
	6 30		42 40	+ 5	.....			
	7 00		42 40	+ 4	.....	17 56,3			
	8 00		42 40	+ 4 $\frac{1}{2}$	.....	17 58			
	10 2		50 30	+ 4	.....	18 7	Eastward	Stars faintly visible	
	11 10		50 30	+ 4	.....	18 6,2	Squally	Cloudy	
	11 55		50 30	+ 4	.....	18 11			
Apr. 13th	1 7	A. M.	50 0	+ 3	.....	18 14	Easterly moderate		
	2 5		49 30	+ 2	.....	18 14,5			
	3 6		50 30	+ 1	.....	18 16,7			
	4 0		51 30	— 1	.....	18 18,5			
	5 30		49 5	— 1	.....	18 22,8			
	6 00		48 30	— 1	.....	18 21,5	Easterly Light	Fine, clear.	Max. easterly var.
	6 30		48 00	— 1	.....			
	7 00		47 00	Zero	.. To the left hand.	18 24,8	N E		
	7 30		46 20	Zero	.....	.....	Squally with drift		
	8 00				.....	18 28,5			
	9 00		44 00	+ 0 $\frac{1}{2}$	.....	18 25,8			
	9 50		43 50	+ 0 $\frac{1}{2}$	.....			
	10 10		41 00	Zero	.. To the left hand.	18 23,1			
	10 30		36 00	Zero	.....			
	+ 11 10		35 40	+ 1	.....	18 21,2			
	11 30		36 5	+ 1	.....	18 11,8			
	1 5	P. M.	37 00	+ 1	.....	18 8,4	Northerly	Hazy	
	1 30		37 00	+ 1	.....	17 58,6	Fresh	.....	Max. westerly var.

North end of Needle to the S E.									
Date.	Mean Time of Observation.	A. M. or P. M.	Reading of north end of Needle.	Temp. Fahrenheit Instr.	Direction of north end of needle during westerly daily variation.	Time that a horizontal needle took to make 60 vibrations.	Winds.	Weather.	Remarks, &c.
1825.	h. m.		o /	o		m. s.			
Apr. 13th	2 15	P. M.	S 37 00 E	+ 1	.....	17 59			
	3 30		37 00	Zero	.....	17 55,6			
	5 30		44 30	— 2	.....	17 54	N. by E.	Hazy	
	6 00		46 00	— 2	.....	17 59,5	Fresh	with drift	
	6 15		47 10	— 2	.....	17 56,5			
	6 30		50 00	— 2	.....			
	7 00		50 00	— 4	.....	17 58,5	Ditto	Ditto	
	7 30		50 00	— 4	.....			
	9 5		49 30	— 5½	.....	18 2,5			
	9 45		49 00	— 6½	.....			
	10 10		47 20	— 7	.....	18 5,6			
	11 00		47 20	— 7	.....	18 2,5			
	11 30		47 10	— 7	.....	.....	Fresh	Cloudy	
	Midn ^t		47 00	— 7	.....	18 3,3	North	overcast	
Apr. 14th	1 10	A. M.	46 30	— 7½	.....	18 14,0	E S E	Cloudy	
	1 30		46 20	— 8	.....		Fresh		
	2 10		45 10	— 8	.....	18 20,8			
	3 7		44 10	— 9	.....	18 22,8	Squally	Thick with drift, zenith clear	Max. easterly variation.
	3 50		43 55	— 9	.....	18 5,7			
	5 10		43 40	— 9	.....	18 22,7			
	6 00		43 40	— 9	.....	18 14,5			
	7 10		43 40	— 10	.....	18 8,8			
	7 35		43 40	— 10	.....			
	7 50		43 20	— 10	.....	18 6			
	9 30		41 30	— 9	.. To the left hand. ..	18 2,7	N. Easterly	Hazy	
	10 00		38 40	— 9	.. ..	18 18,5	Squally		
	10 30		38 30	— 9	.. ..			
	11 00		43 30	— 9	.. ..	17 56			
	11 30		44 40	— 8	.. ..			
	0 5	P. M.	37 50	— 6	.. ..	18 5			
	0 20		30 00	— 6	.....	.....	.....	...	Max. westerly variation.
	0 30		28 45	— 6	.....	.....	.....	...
	+ 0 48		25 10	— 5½	.....	.....	.....	...
	1 20		35 10	— 5½	.....	17 57			
	2 00		39 00	— 5	.....	18 2			
	2 30		32 10	— 4	.....			
	3 00		38 20	— 4	.....	17 48			
	4 00		39 30	— 4	.....	17 48,2			
	5 10		42 00	— 4	.....	17 40,5			
	5 50		51 10	— 5	.....	17 26,8			
	6 50		49 30	— 6	.....	17 35,7	Northerly	Hazy	
	7 10		50 20	— 7	.....		Squally	low down	
	7 48		51 00	— 8	.....	17 25,2			
	9 30		52 30	— 8	.....	17 44			
	10 00		57 10	— 8	.....	17 50,7			
	10 30		62 00	— 9	.....			
	11 00		59 30	— 9	.....	18 00	.....	.....	Max. easterly variation.
	11 30		58 20	— 9	.....			
	11 40		56 20	— 9	.....			
	Midn ^t		54 00	— 9½	.....	18 6,5	Fresh and Squally	Clear over head	

March 22nd. North end of Needle to the S. 83° W.

THE following summary of the observations at this point, is given here, merely to prevent breaking the preceding series : they were commenced at 6 o'clock in the morning, at which time the north end of the needle was at S. 83° 30' W. where it remained until $\frac{1}{2}$ past 9^h; it then moved to S. 85° W. and became nearly stationary until about 11^h 30^m, at which time it was at S. 81° 30' W. and soon after, I observed it vibrating rapidly in very small arcs, which were continued with different degrees of intensity for the space of a quarter of an hour. During this time, simultaneous observations on the times of vibration of a horizontal needle were made, and as great fluctuations were observed in the intervals of 10 vibrations, I have inserted them in detail, as follows, in order to show the variations of horizontal intensity which take place in short intervals, and to which must be attributed the irregular vibratory motion observed in this needle.

Mean Time of Observation.			Intervals of 10 vibrat.	Remarks.
h.	m.	s.	m. s.	It appears by these observations, that the intervals of 10 vibrations, exhibit changes of horizontal intensity to the amount of $\frac{1}{39}$ th part of those intervals, in the space of quarter of an hour.
11	38	5,2		
	41	10	3 4,8	
	44	13	3 3	
	47	16,5	3 3,5	
	50	19	3 2,5	
	53	20,7	3 1,7	
	56	22,5	3 1,8	

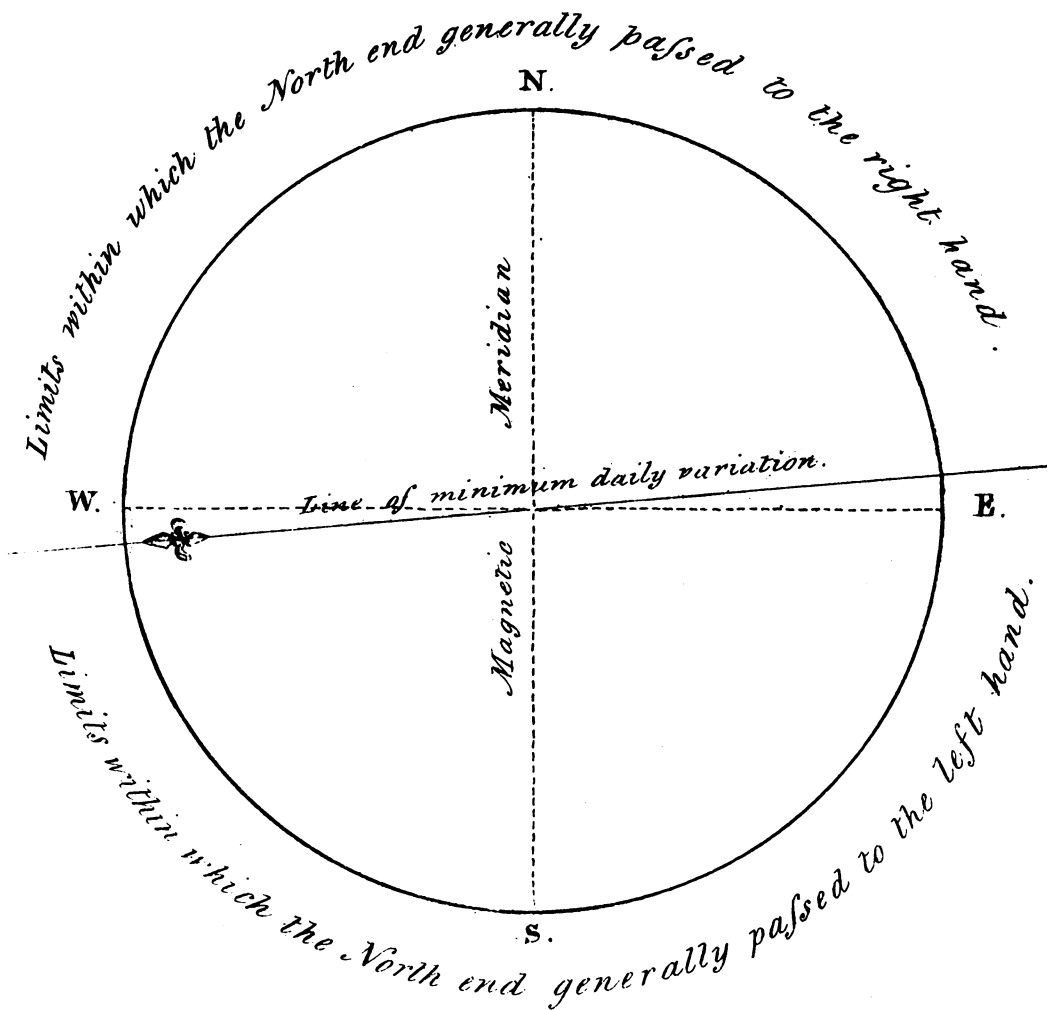
IN the foregoing observations, when the north end of the needle was directed towards the east or west points of the compass, it will be seen, that the various deflections of the needle rendered it difficult to discover which way its north end had proceeded during the time of westerly daily variation.

This anomalous action of the needle exhibited itself so strongly on the 23d of February, that I was induced to compare the nature of some of its deflections, with simultaneous observations, on the times of vibration of a freely suspended horizontal needle ; and as I found, in every instance of comparison, a decided relation between the changes of horizontal intensity, and these deflections, I began to watch the action of this needle more closely, at the times that fluctuations in the directive force of the horizontal needle, had hitherto been observed to take place ; and from its indications, I frequently stated to the Gentlemen making the observations on horizontal intensity, what I considered would be the nature of the intervals they were about to obtain ; which proving correct, no longer left any doubt on my mind, of the cause of these apparent irregularities. In order, however, to point out more satisfactorily the relation between the changes of horizontal intensity, and the various deflections of this needle, at other positions of its north end, I have annexed the observations on the times of performing 60 vibrations by a horizontal needle, taken during the same time ; but this will not explain all the anomalies alluded to, without also stating, that the fluctuations which frequently took place in the intervals of 10 vibrations, were sometimes observed to compensate one another, so as, in the mean of sixty, to leave no

indications of such changes having taken place ; and it is only on these occasions, that the expression for the magnetic intensity of the horizontal needle is at variance with the irregular motion of the neutralized needle.

On looking over the observations it will also be seen, that when the north end of the needle was directed to the southward, between N. 85° E. and S. 85° W. its motion during the time of westerly daily variation was generally towards the *left hand*, but when directed to the northward, between N. 85° E. and S. 85° W. its motion was then most commonly to the *right hand* (see the figure in Plate IV.); and that when held between N. 85° E. and north, a greater daily change obtained than at any of the other positions, amounting in one instance to 50 degrees; but when directed to S. 85° W. no daily variation, or at least a minimum, exhibited itself.

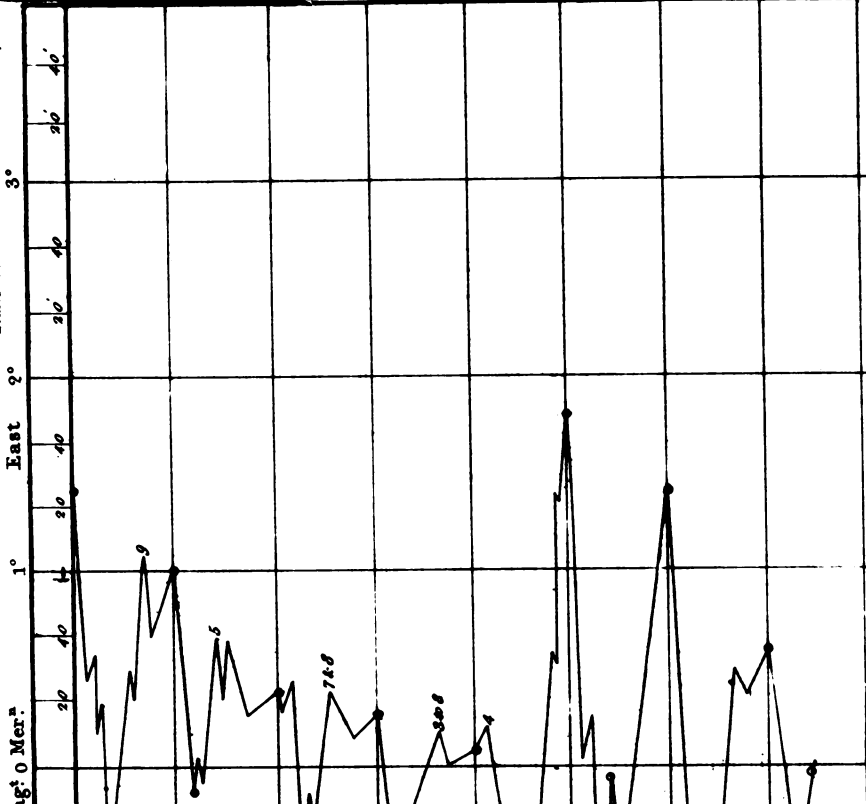
With respect to the effect produced on the needle when held between N. 85° E. and north, it appears, from observations on the times of vibrations of a horizontal needle, that an increased intensity generally took place about noon, at which time also, the maximum westerly daily variation generally happened ; and as we have already seen, that the motion of the north end of the needle in this position, during the time of westerly daily variation, was to the *right hand*, or towards the magnetic meridian, the effect of an increased intensity would be to draw it still further in that direction, and therefore, produce the extraordinary amount noticed. But with the north end of the needle, held between S. 85° W. and north, where its motion is still to the *right hand* at the time of westerly daily variation, the effect of increased intensity then, would be to draw the north end of the needle to the

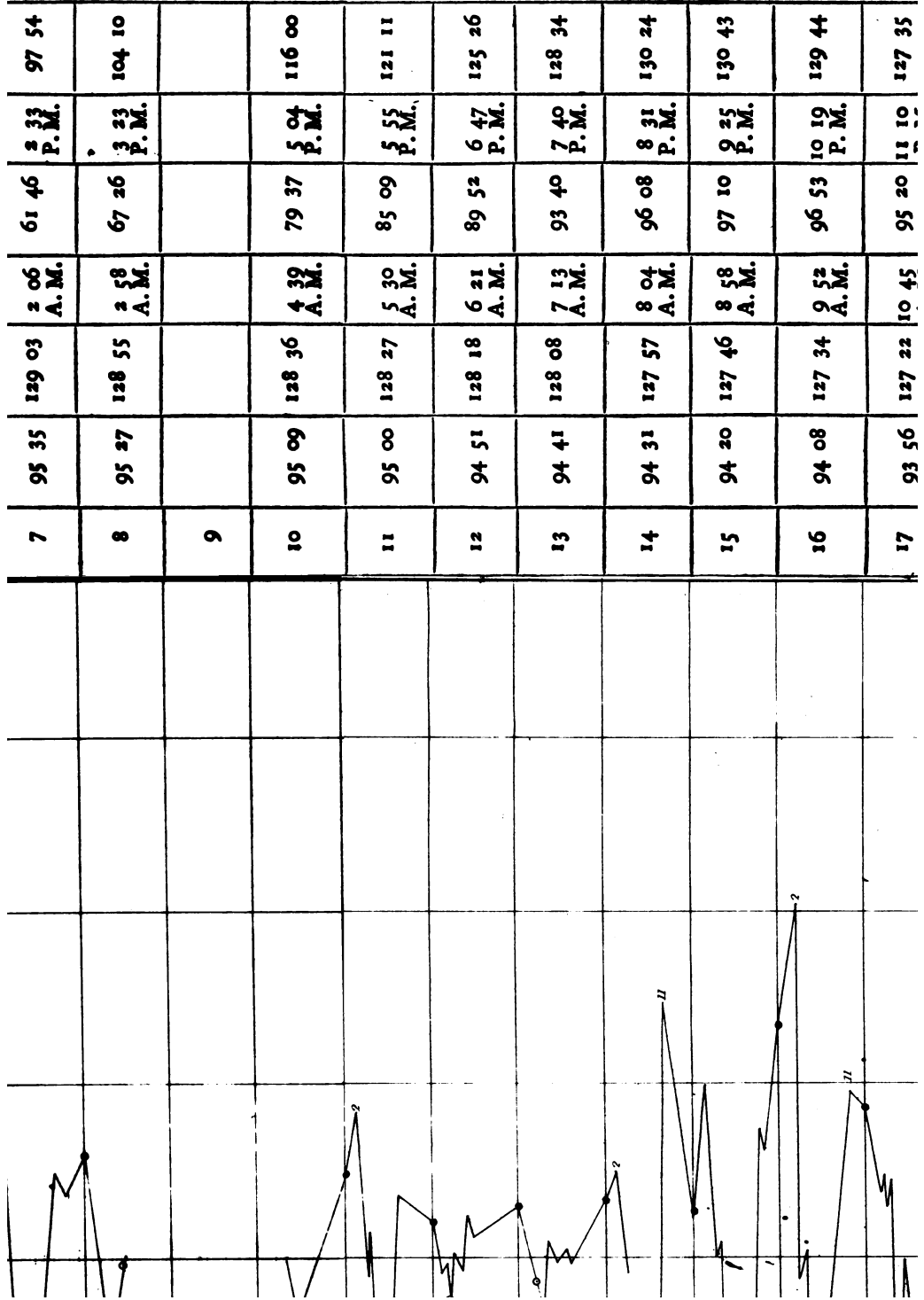


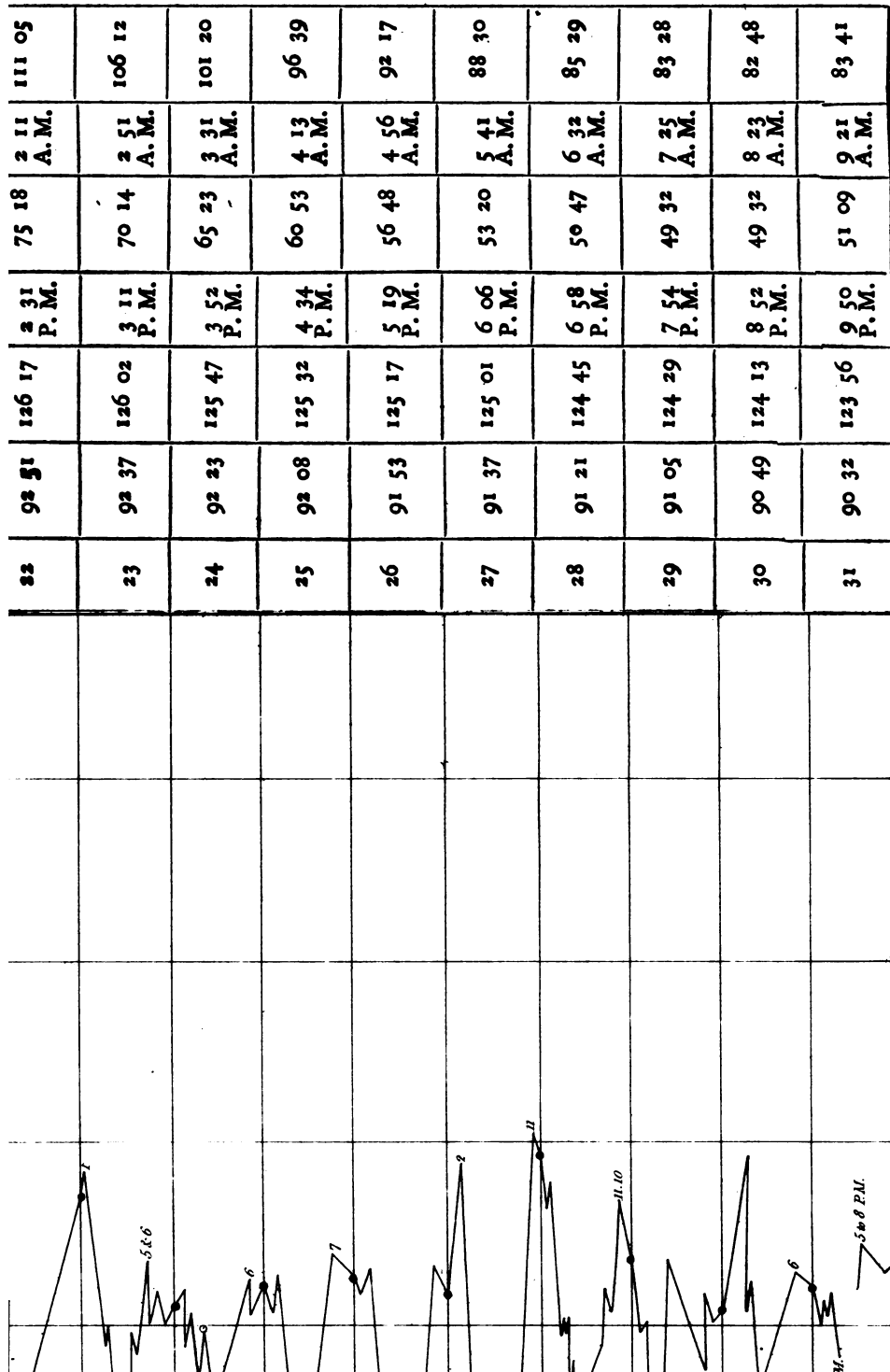
Needle I.

1885.	Sun's Zenith Distance.		Moon on the South Meridian.		Moon on the North Meridian.	
	On the S. Meridian.	On the N. Meridian.	Time of passing.	Zenith Distance.	Time of passing.	Zenith Distance.
1	96 14	96 43	h. m. 9 20 P. M.	0 49 47	h. m. 8 53 A. M.	0 83 46
2	96 09	129 38	10 17 P. M.	49 14	9 48 A. M.	82 55
3	96 03	129 32	11 16 P. M.	50 09	10 46 A. M.	83 02
4	95 57	129 25			11 44 A. M.	84 45
5	95 50	129 18	0 14 A. M.	52 42	0 43 P. M.	88 02
6	95 43	129 11	1 11 A. M.	56 39	1 39 P. M.	92 34
7	95 35	129 03	2 06 A. M.	61 46	2 33 P. M.	97 54
8	95 27	128 55	2 58 A. M.	67 26	3 23 P. M.	104 10

Phil. Trans. MDCCCXXVI. Pt. I. Part IV. p. 174.



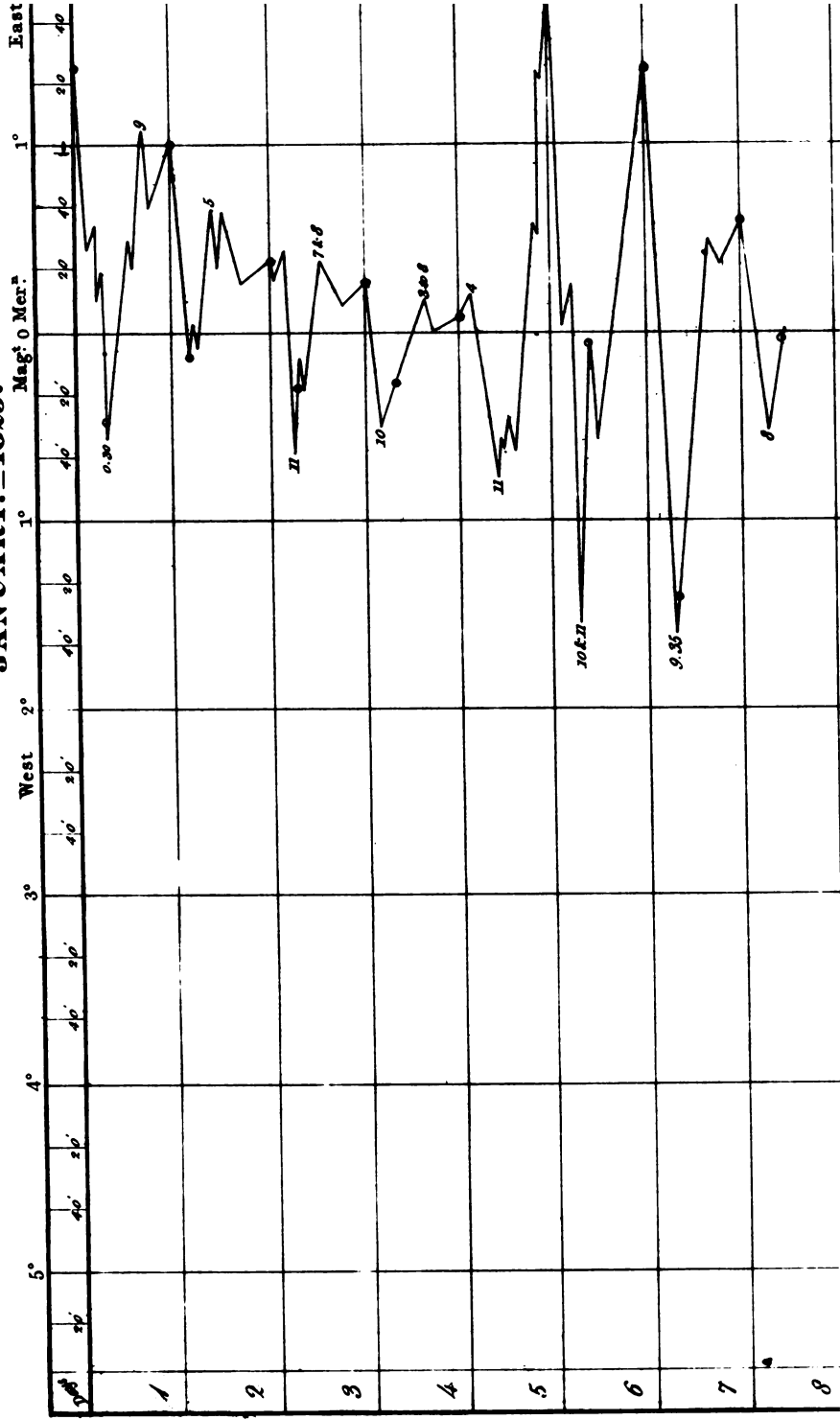


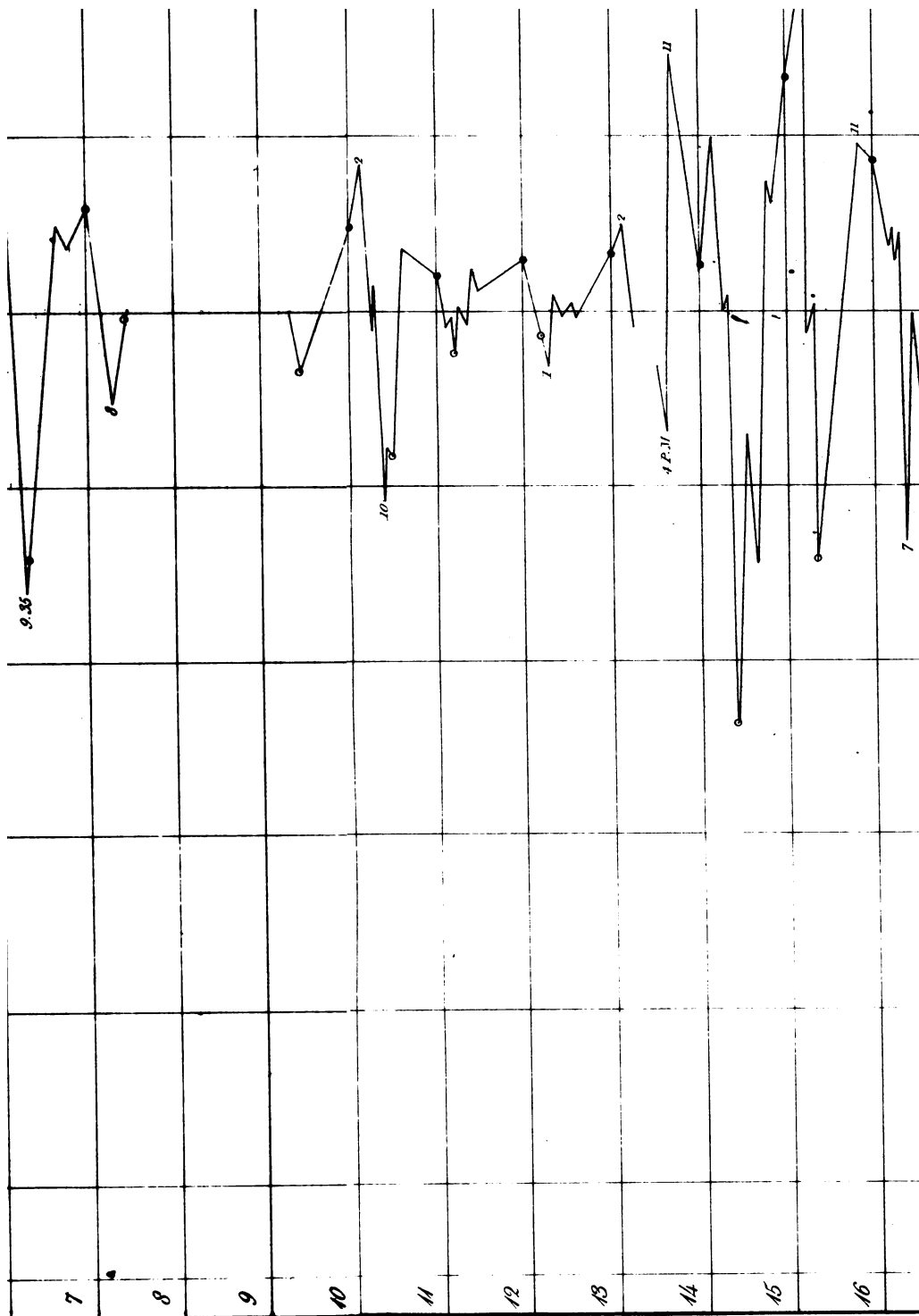


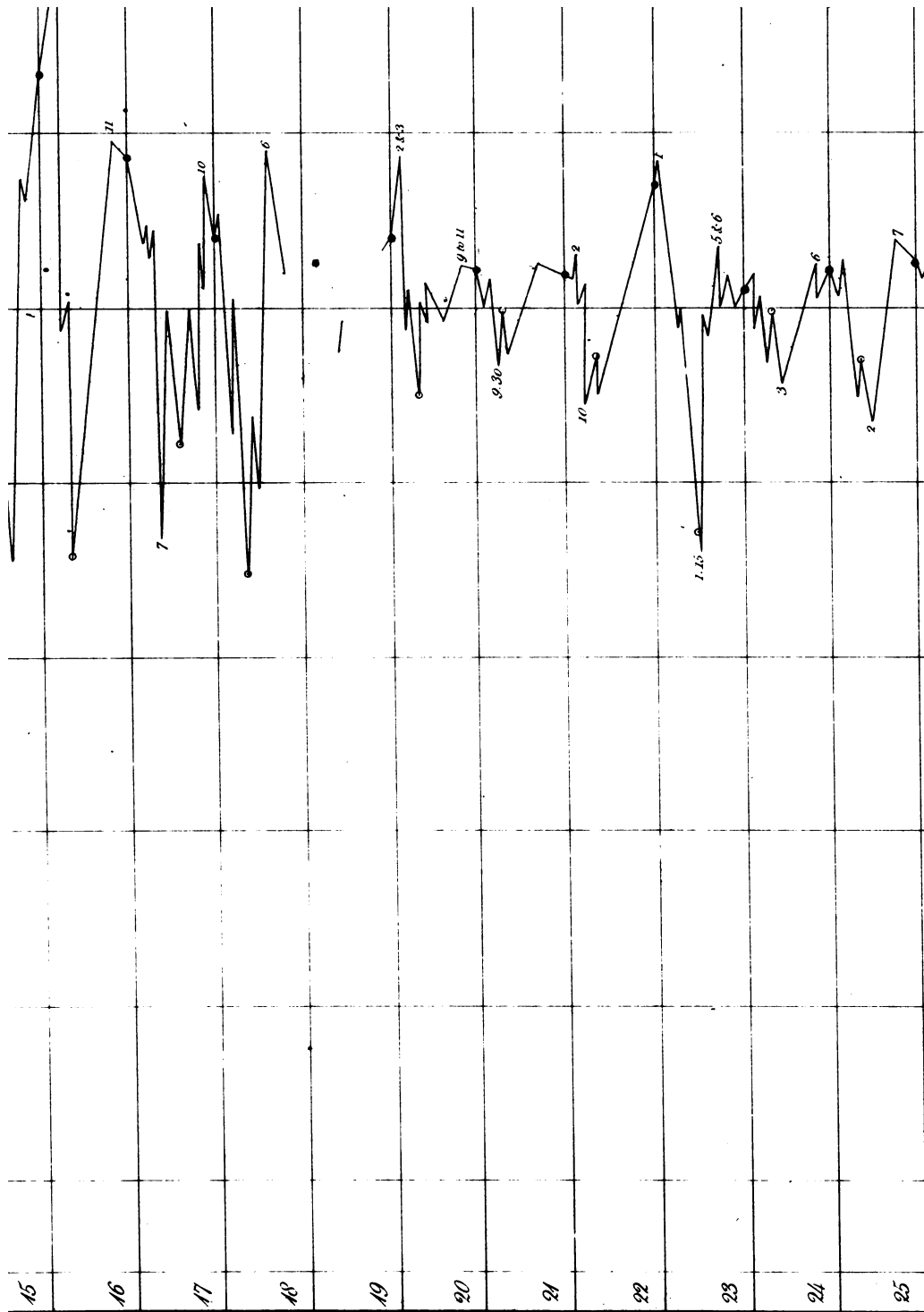
S. Baur. 20

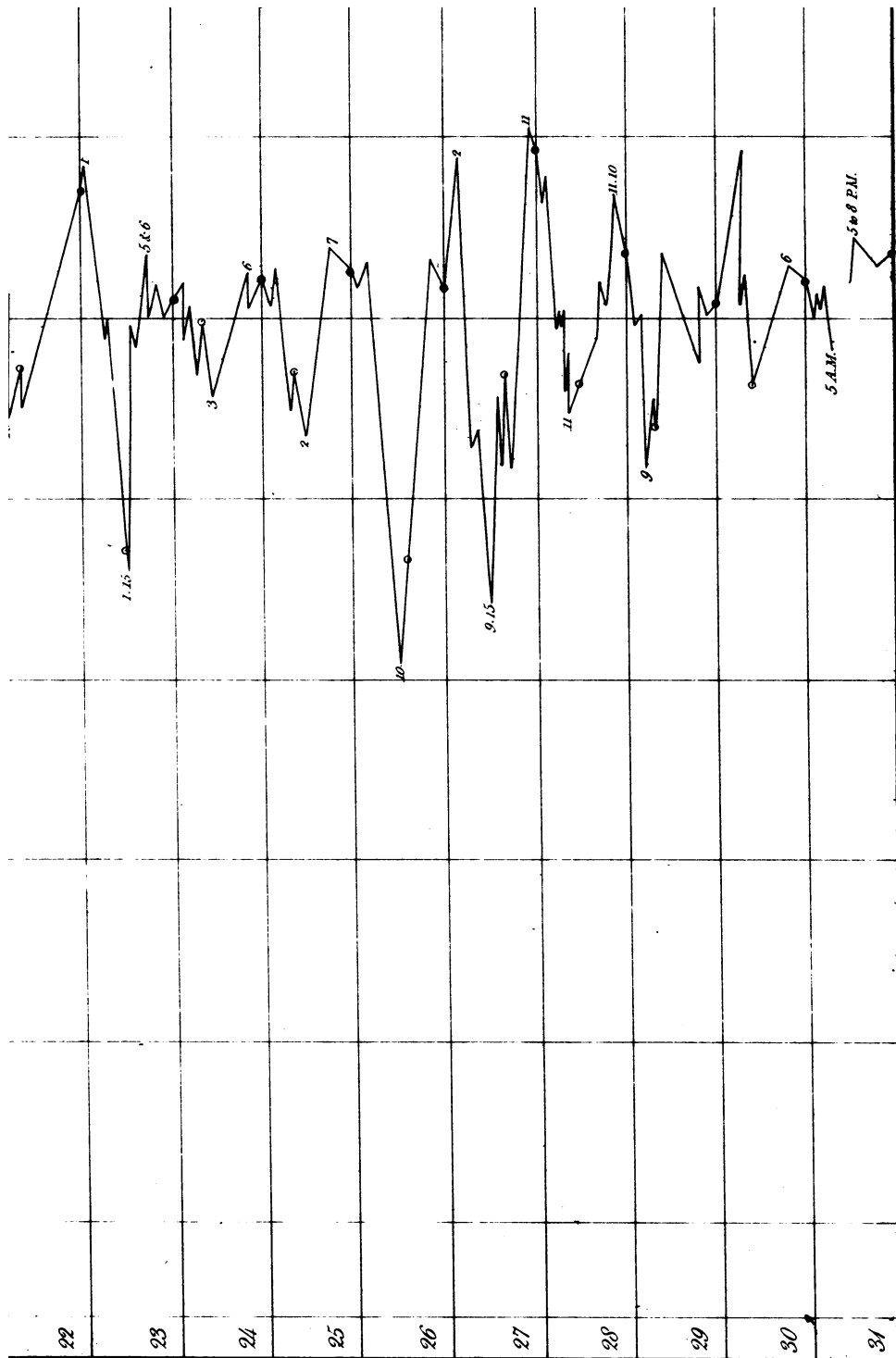
at the intervening figures, the intermediate hours.

JANUARY. 1825.



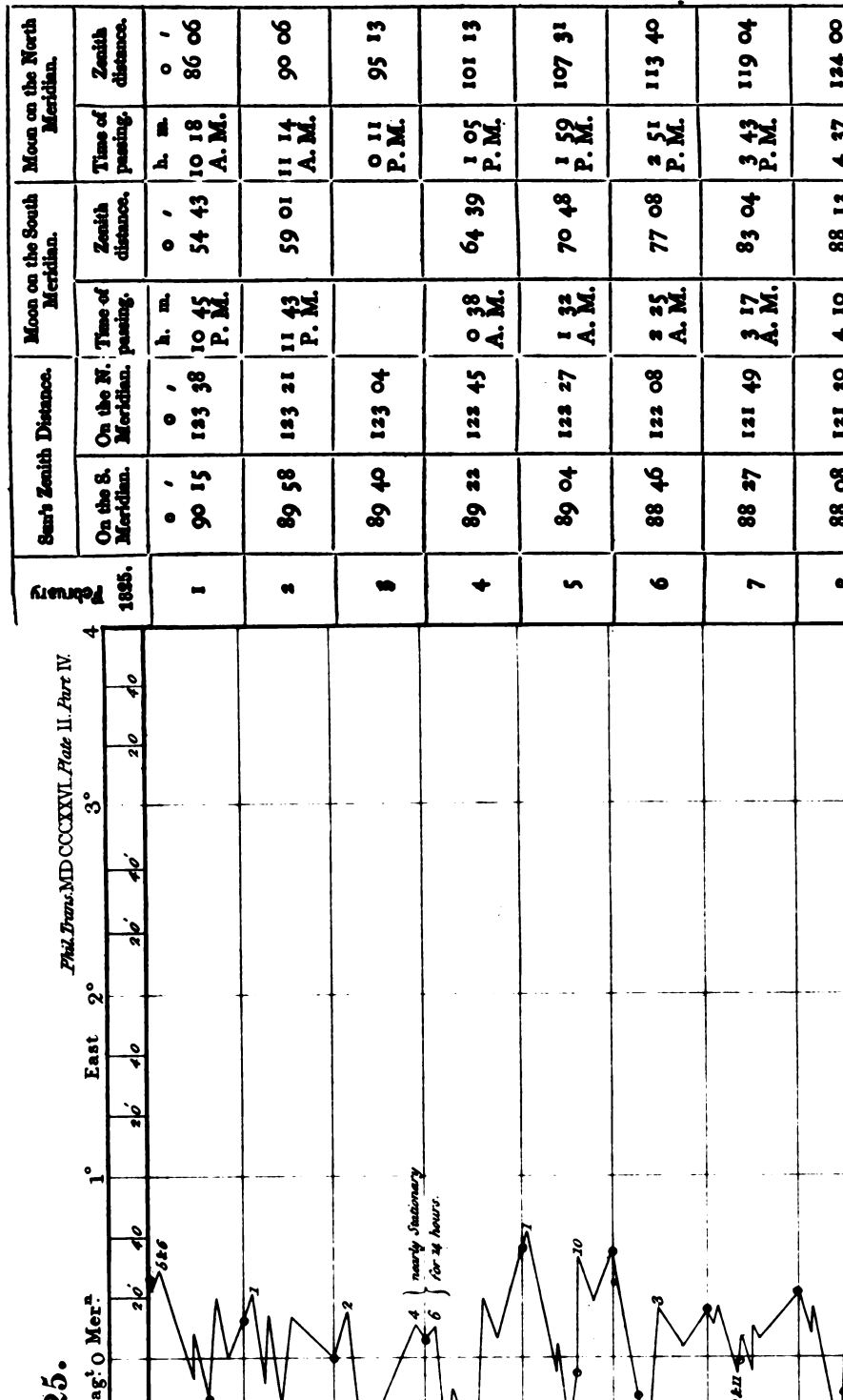


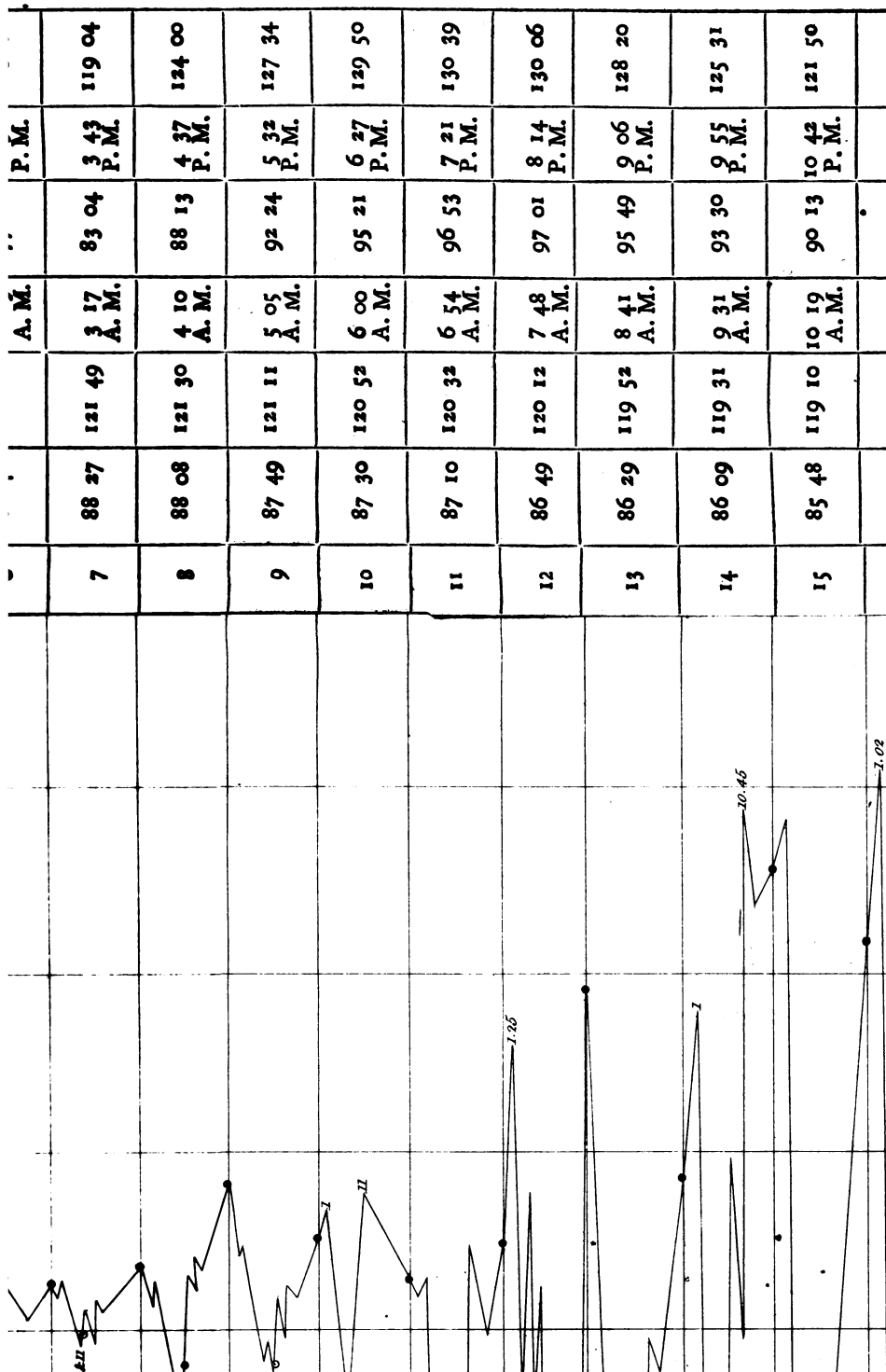


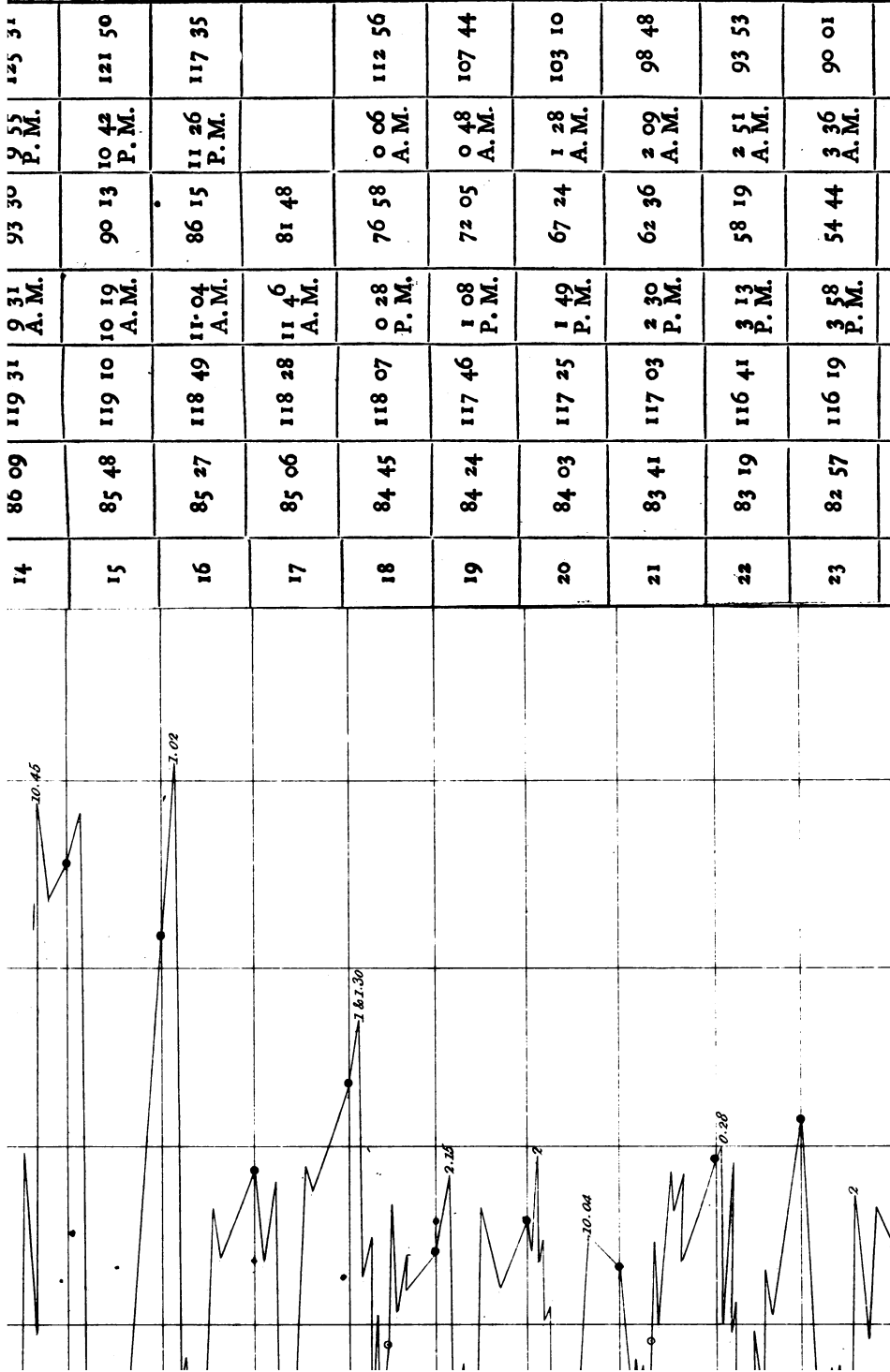


Note, The dark circular spots indicate Midnight, the light ones Noon; and the intervening figures, the intermedia

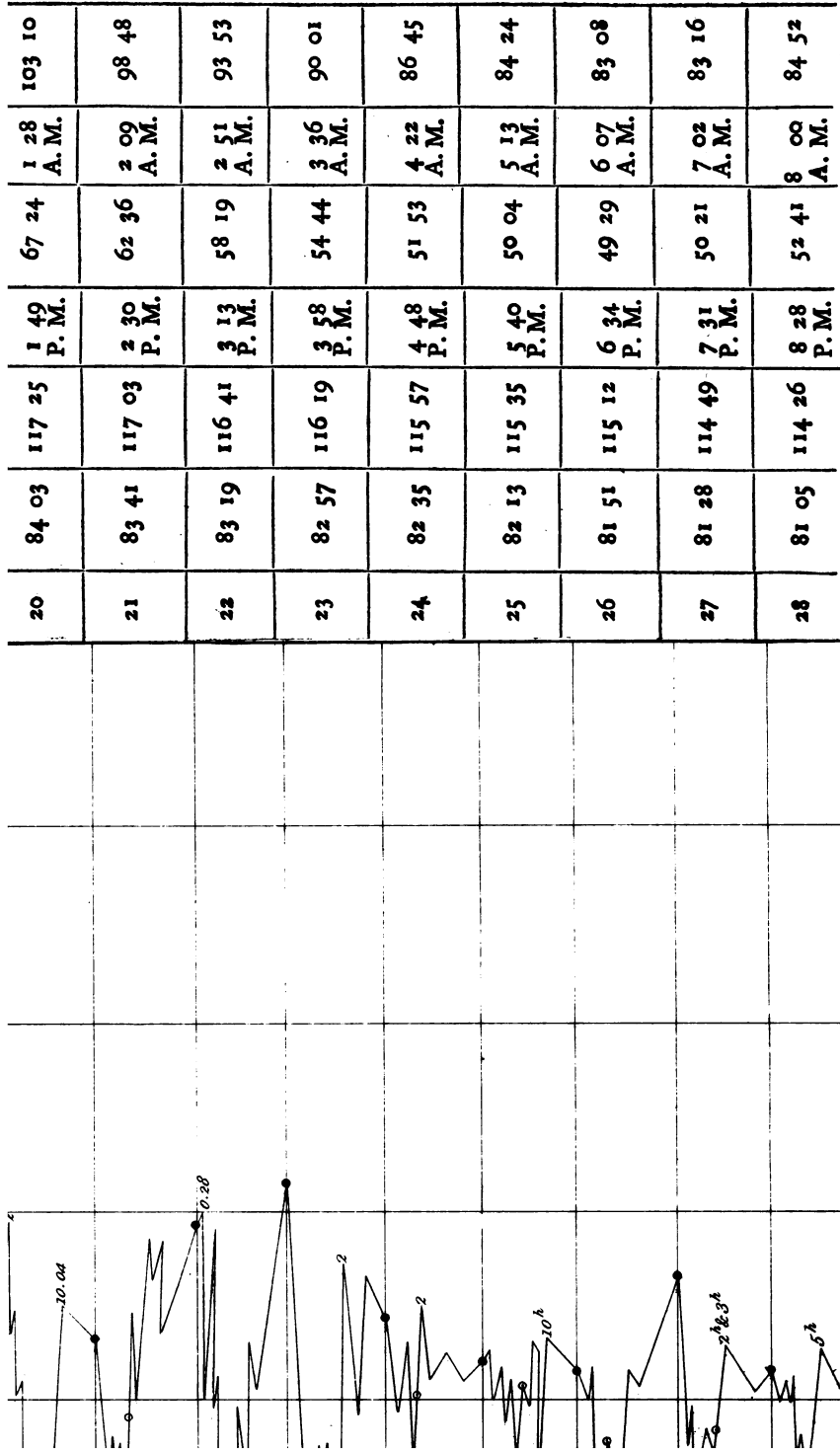
Needle I.







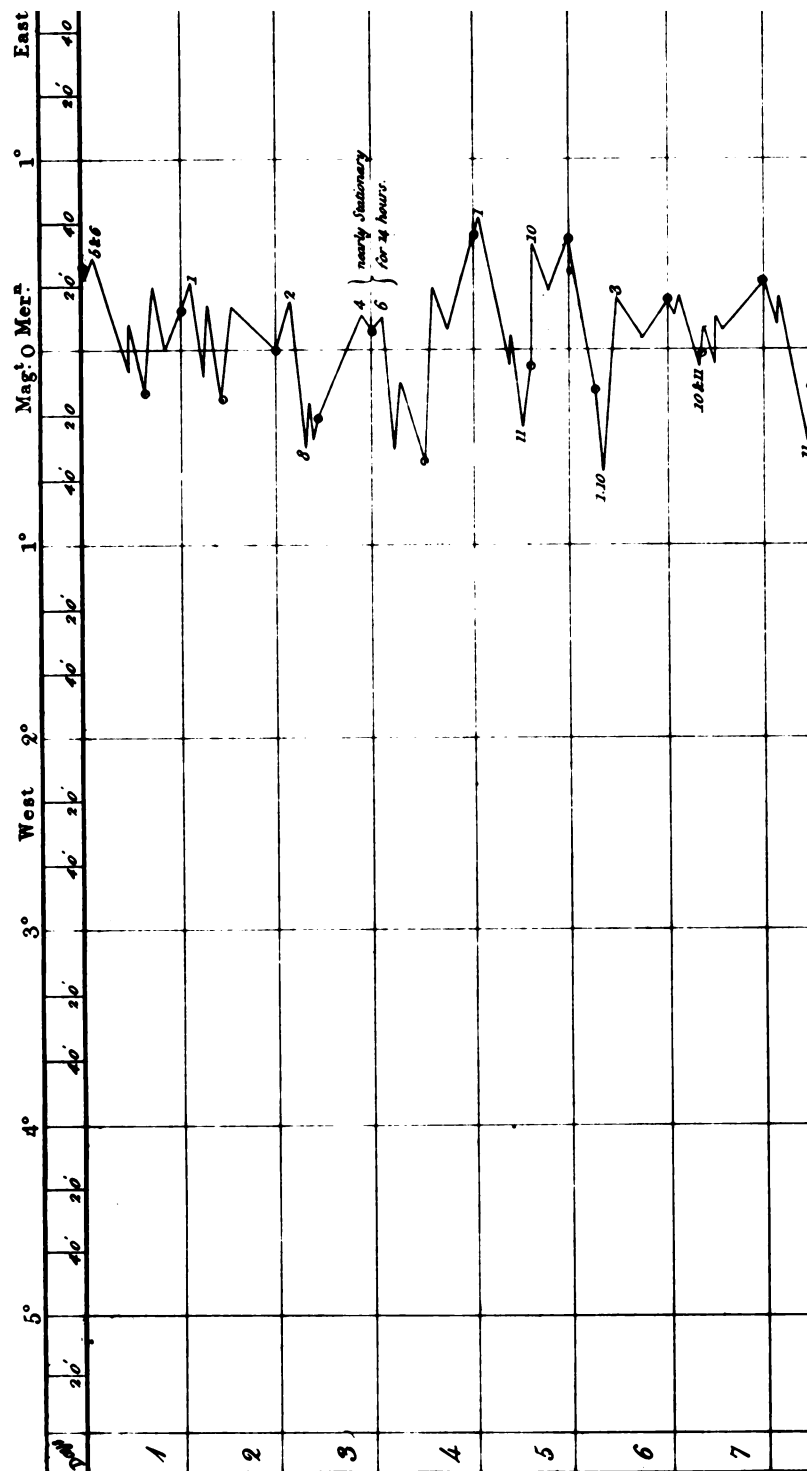
14	86 09	119 31	9 31 A.M.	93 30	9 55 P.M.	125 31
15	85 48	119 10	10 19 A.M.	90 13	10 42 P.M.	121 50
16	85 27	118 49	11 04 A.M.	86 15	11 26 P.M.	117 35
17	85 06	118 28	11 46 A.M.	81 48		
18	84 45	118 07	0 28 P.M.	76 58	0 06 A.M.	112 56
19	84 24	117 46	1 08 P.M.	72 05	0 48 A.M.	107 44
20	84 03	117 25	1 49 P.M.	67 24	1 28 A.M.	103 10
21	83 41	117 03	2 30 P.M.	62 36	2 09 A.M.	98 48
22	83 19	116 41	3 13 P.M.	58 19	2 51 A.M.	93 53
23	82 57	116 19	3 58 P.M.	54 44	3 36 A.M.	90 01

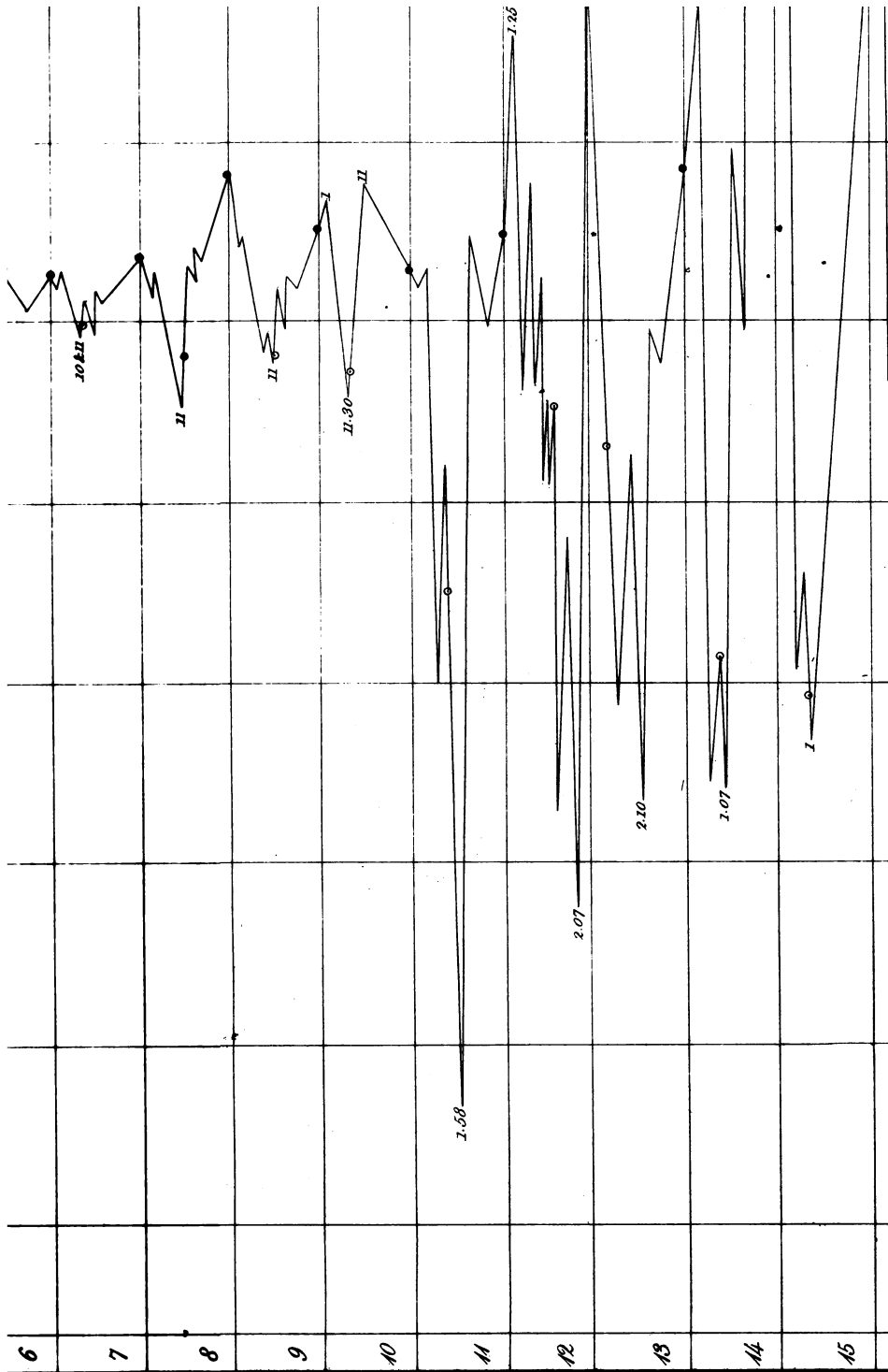


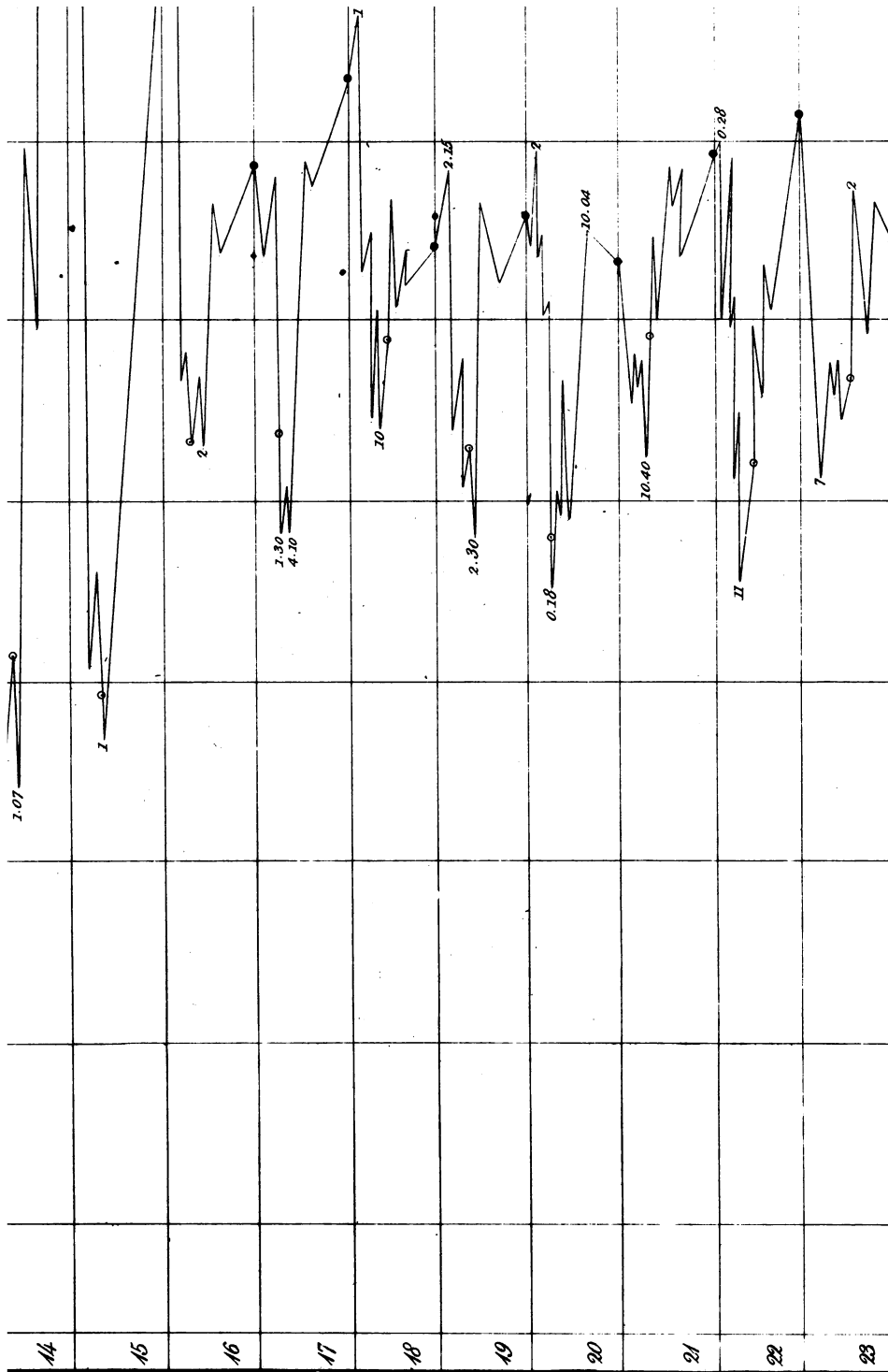
S. Bawie. 10

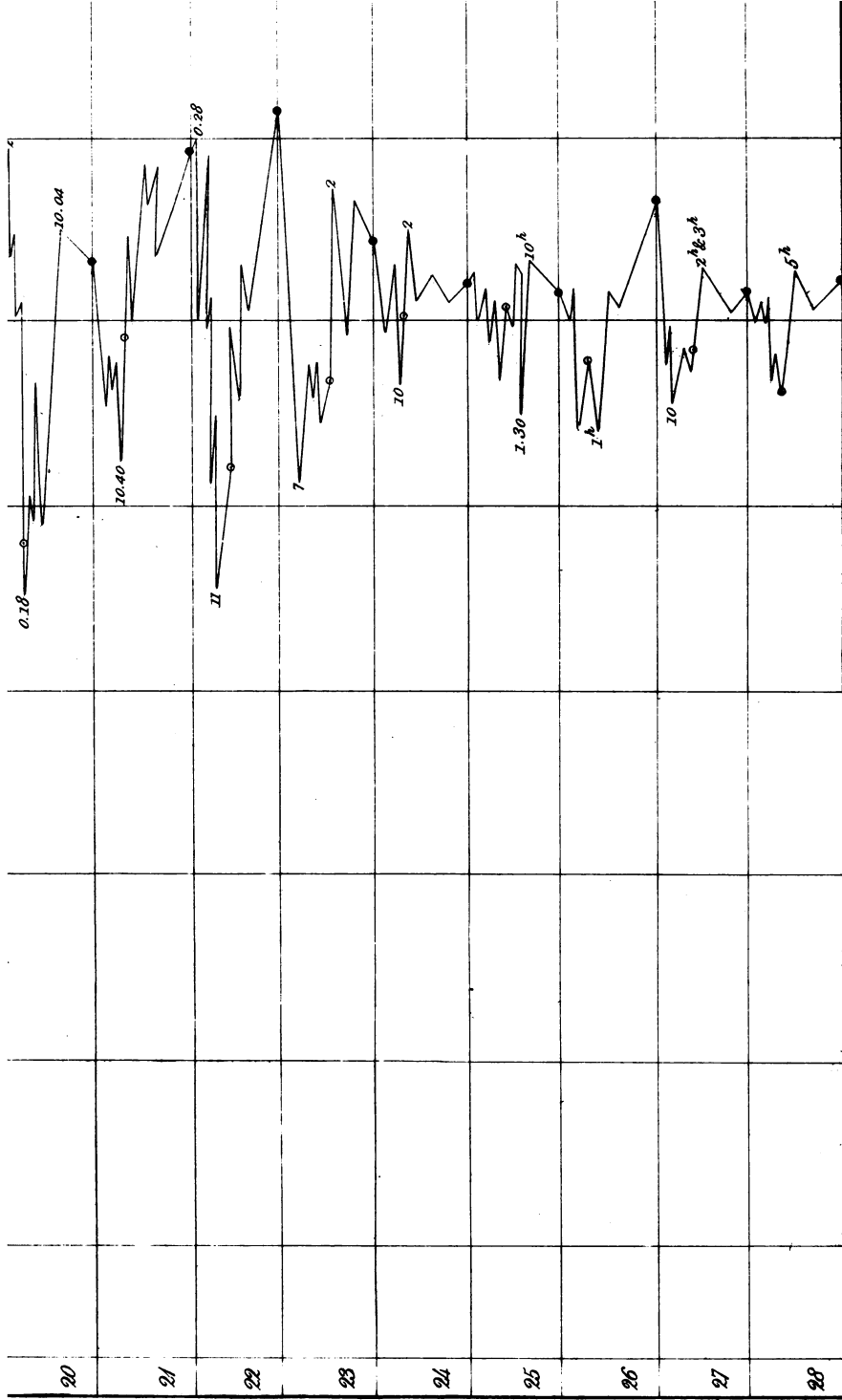
and the intervening figures, the intermediate hours.

FEBRUARY. 1825.





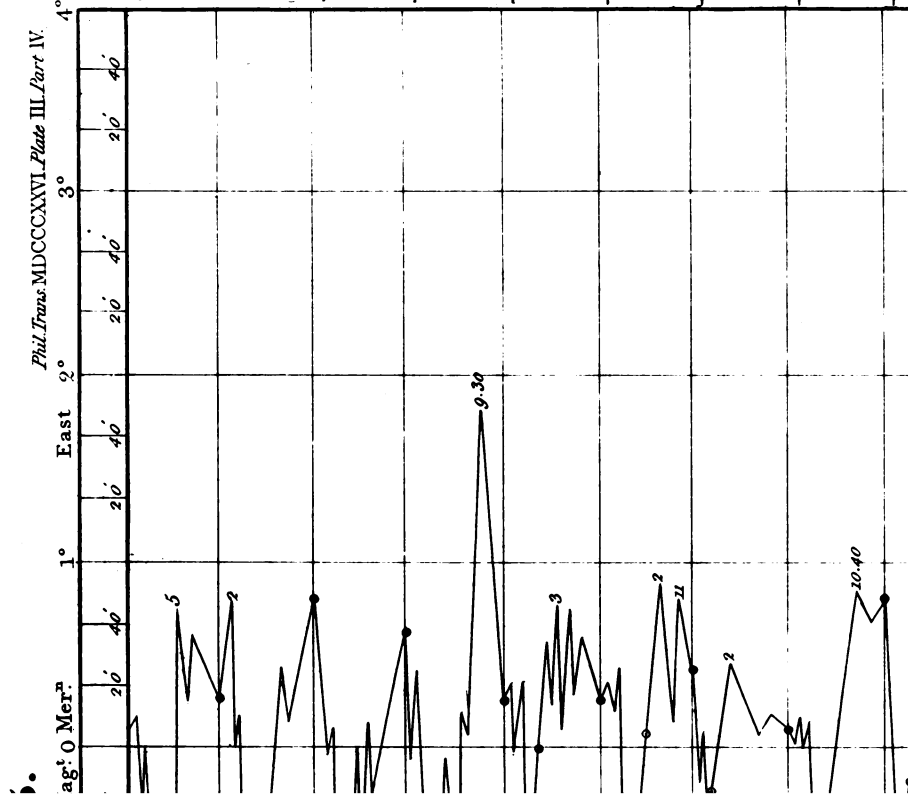


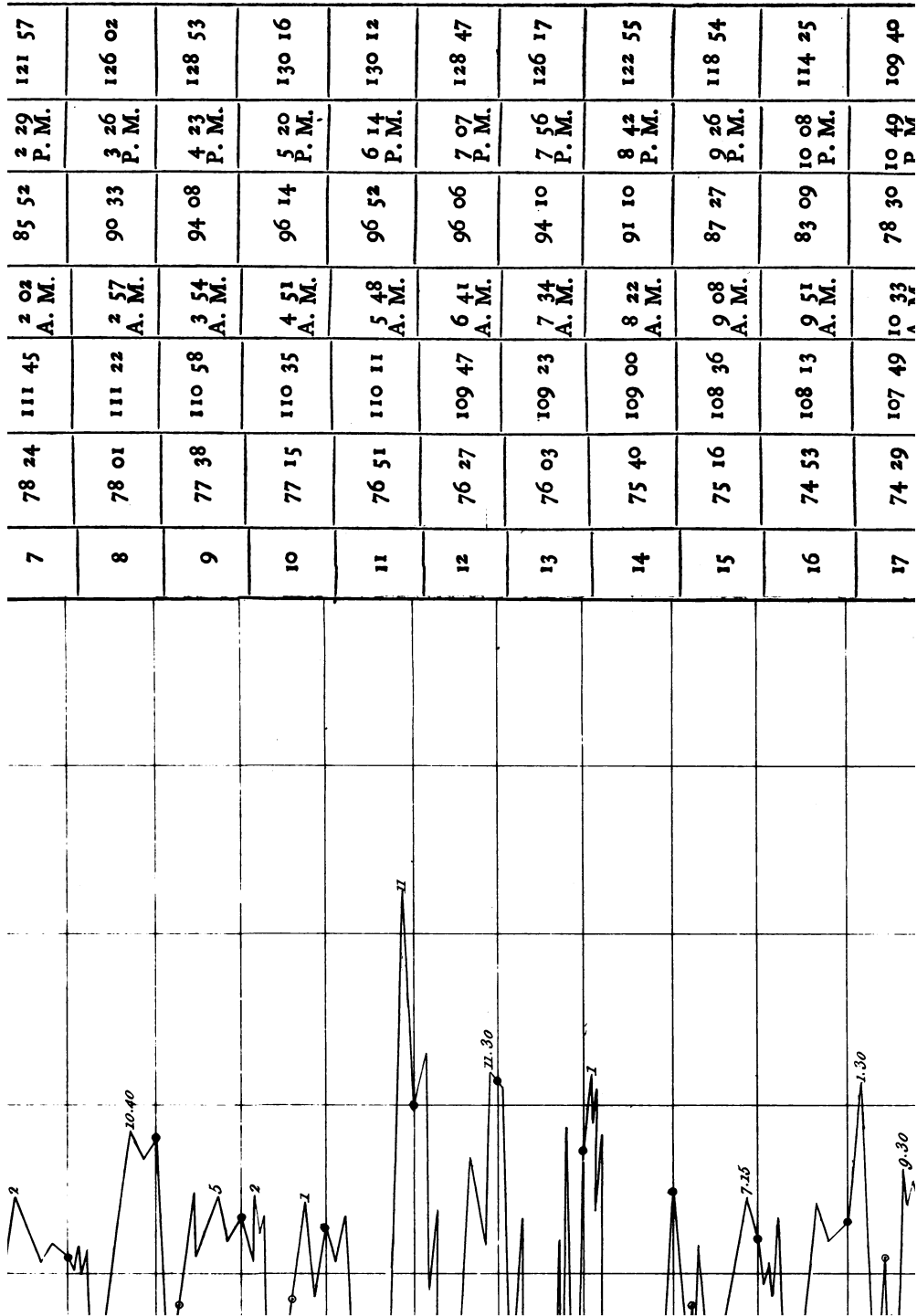


Note. The dark circular spots indicate Midnight; the light ones, Noon; and the intervening figures, the interned.

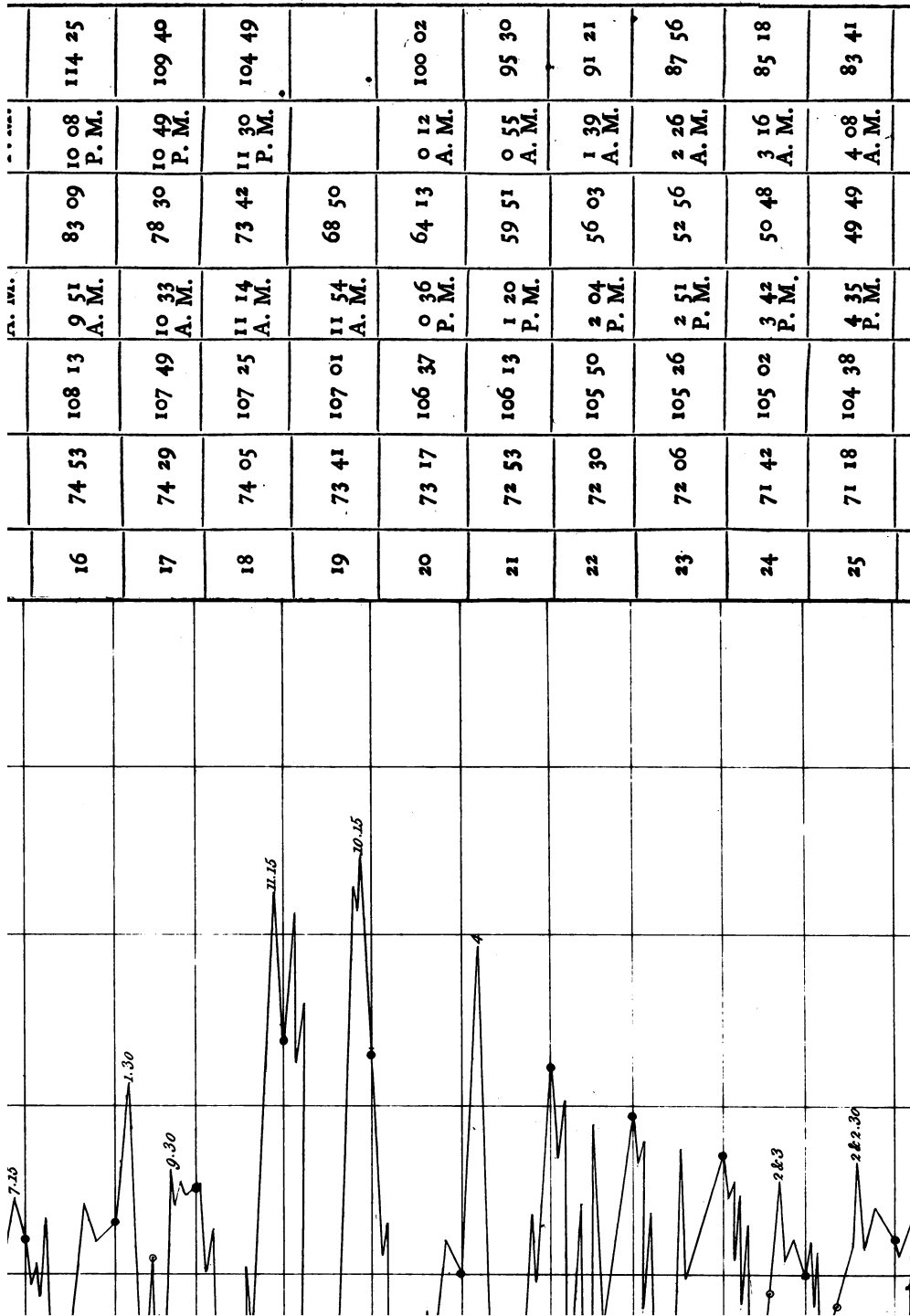
Needle I.

Mag. 1825.	Sun's Zenith Distance.		Moon on the South Meridian.		Moon on the North Meridian.	
	On the S. Meridian.	On the N. Meridian.	Time of passing.	Zenith distance.	Time of passing.	Zenith distance.
1	80 42	114 03	h. m. 9 26 P. M.	56 31	h. m. 8 58 A. M.	87 56
2	80 19	113 40	10 22 P. M.	61 31	9 54 A. M.	92 25
3	79 56	113 17	11 18 P. M.	67 22	10 50 A. M.	97 53
4	79 33	112 54			11 44 A. M.	104 03
5	79 10	112 31	00 12 A. M.	73 41	0 39 P. M.	110 27
6	78 47	112 08	1 07 A. M.	80 01	1 34 P. M.	116 34
7	78 24	111 45	2 02 A. M.	85 52	2 29 P. M.	121 57
8	78 01	111 22	2 57 A. M.	90 33	3 26 P. M.	126 02

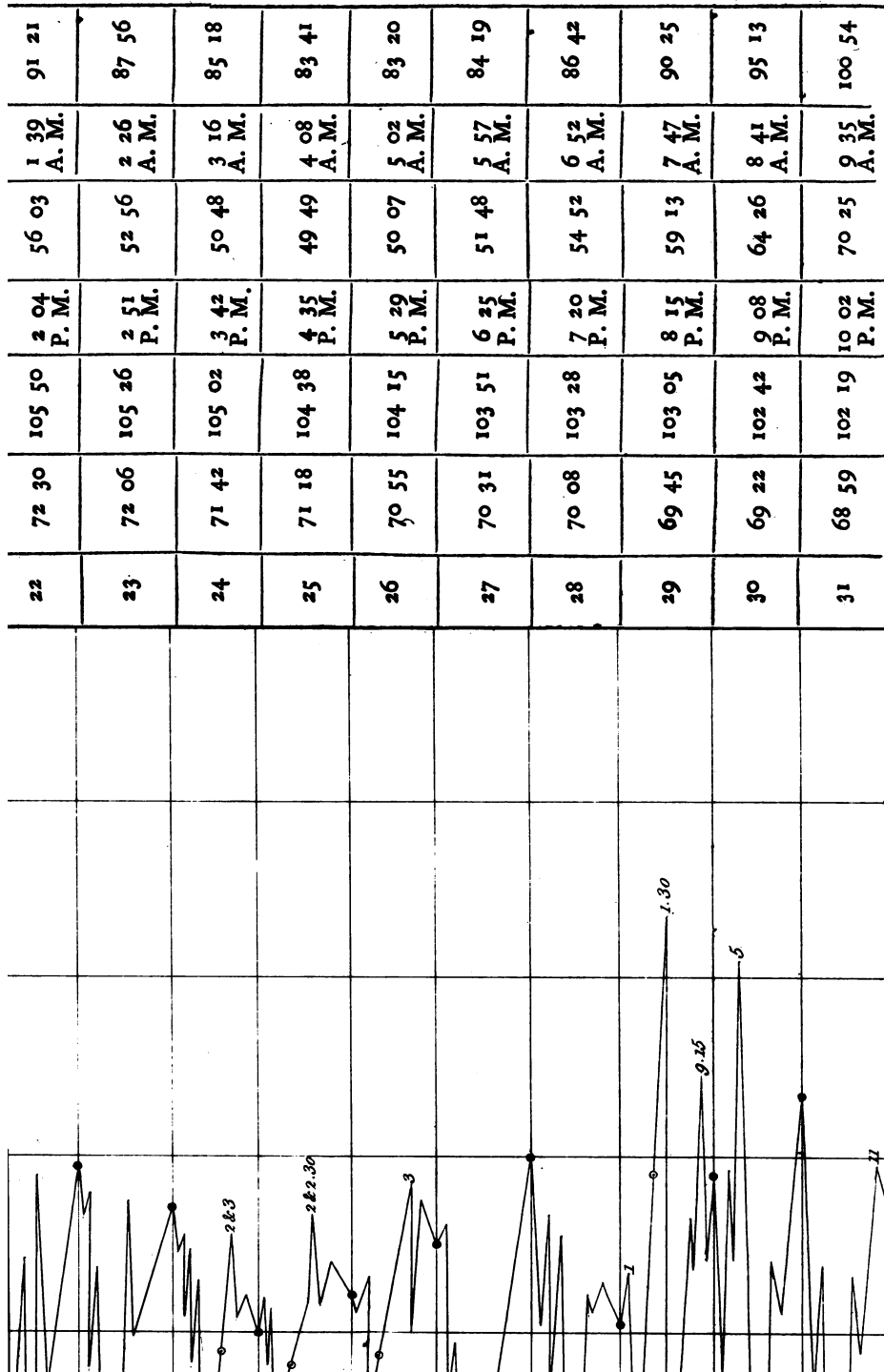




7	78 24	111 45	2 02 A. M.	85 52	2 29 P. M.	121 57
8	78 01	111 22	2 57 A. M.	90 33	3 26 P. M.	126 02
9	77 38	110 58	3 54 A. M.	94 08	4 23 P. M.	128 53
10	77 15	110 35	4 51 A. M.	96 14	5 20 P. M.	130 16
11	76 51	110 11	5 48 A. M.	96 52	6 14 P. M.	130 12
12	76 27	109 47	6 41 A. M.	96 06	7 07 P. M.	128 47
13	76 03	109 23	7 34 A. M.	94 10	7 56 P. M.	126 17
14	75 40	109 00	8 22 A. M.	91 10	8 42 P. M.	122 55
15	75 16	108 36	9 08 A. M.	87 27	9 26 P. M.	118 54
16	74 53	108 13	9 51 A. M.	83 09	10 08 P. M.	114 25
17	74 29	107 49	10 33 A. M.	78 30	10 49 P. M.	109 40



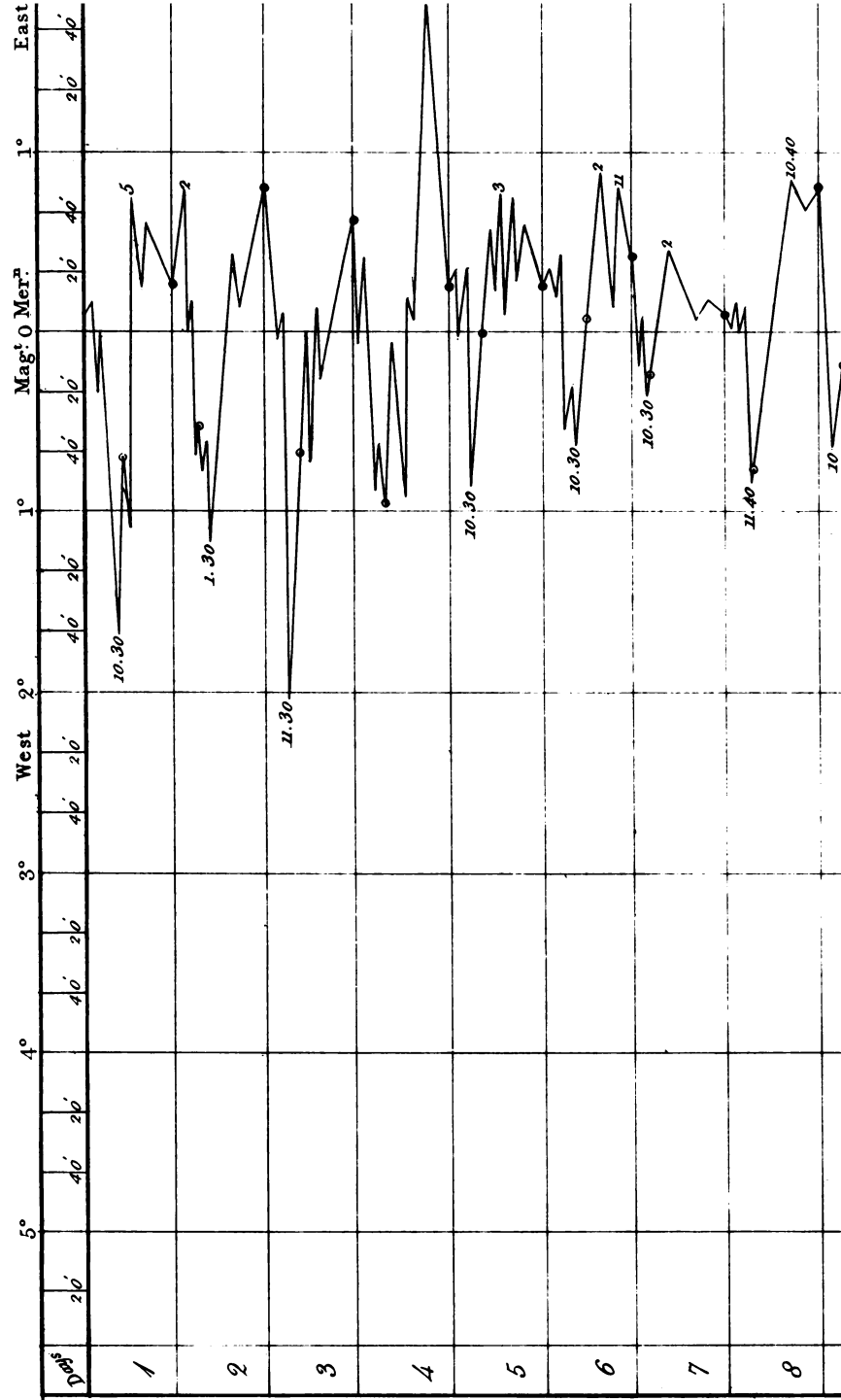
16	74 53	108 13	9 51 A. M.	83 09	10 08 P. M.	114 25
17	74 29	107 49	10 33 A. M.	78 30	10 49 P. M.	109 40
18	74 05	107 25	11 14 A. M.	73 42	11 30 P. M.	104 49
19	73 41	107 01	11 54 A. M.	68 50		
20	73 17	106 37	0 36 P. M.	64 13	0 12 A. M.	100 02
21	72 53	106 13	1 20 P. M.	59 51	0 55 A. M.	95 30
22	72 30	105 50	2 04 P. M.	56 03	1 39 A. M.	91 21
23	72 06	105 26	2 51 P. M.	52 56	2 26 A. M.	87 56
24	71 42	105 02	3 42 P. M.	50 48	3 16 A. M.	85 18
25	71 18	104 38	4 35 P. M.	49 49	4 08 A. M.	83 41

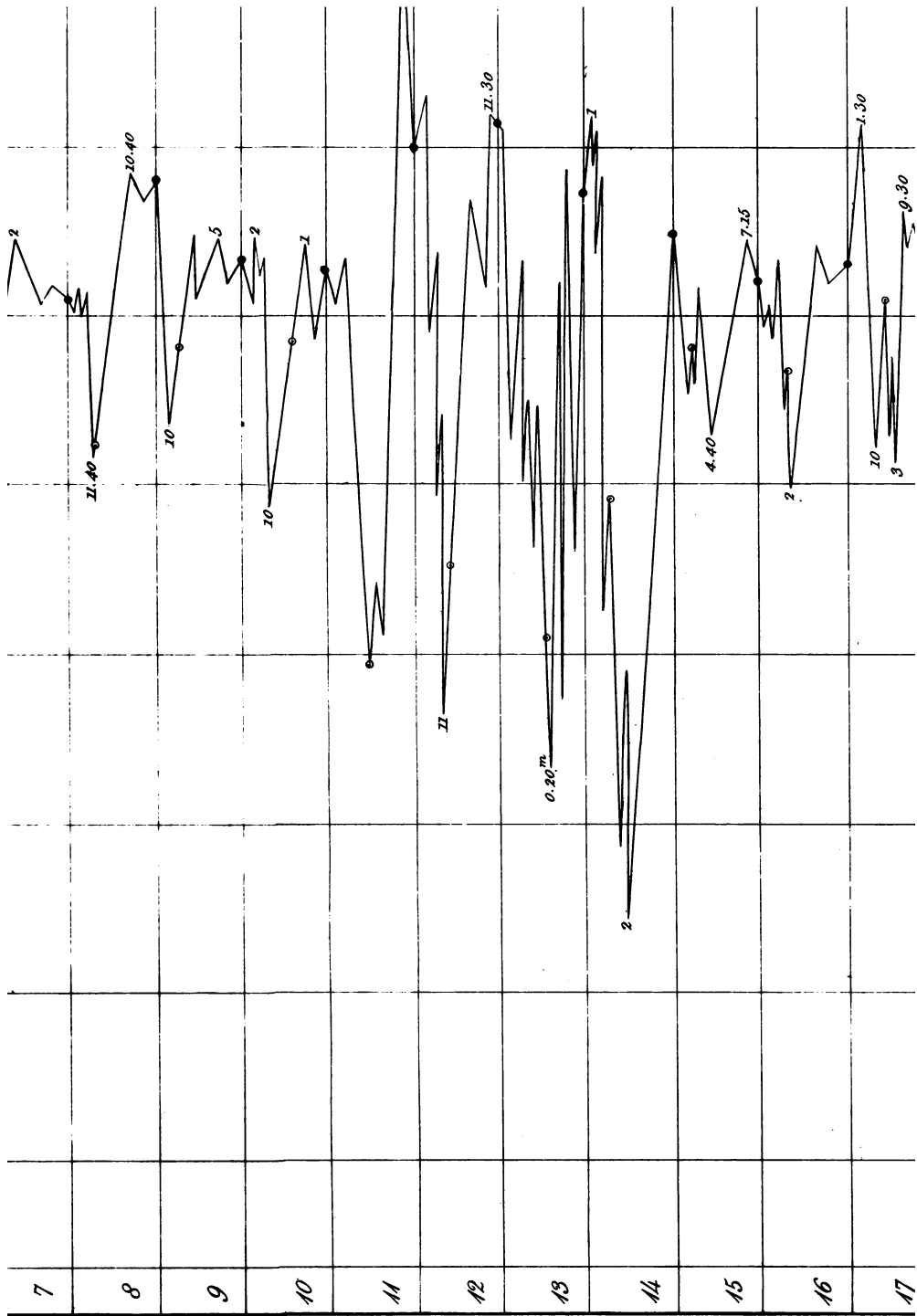


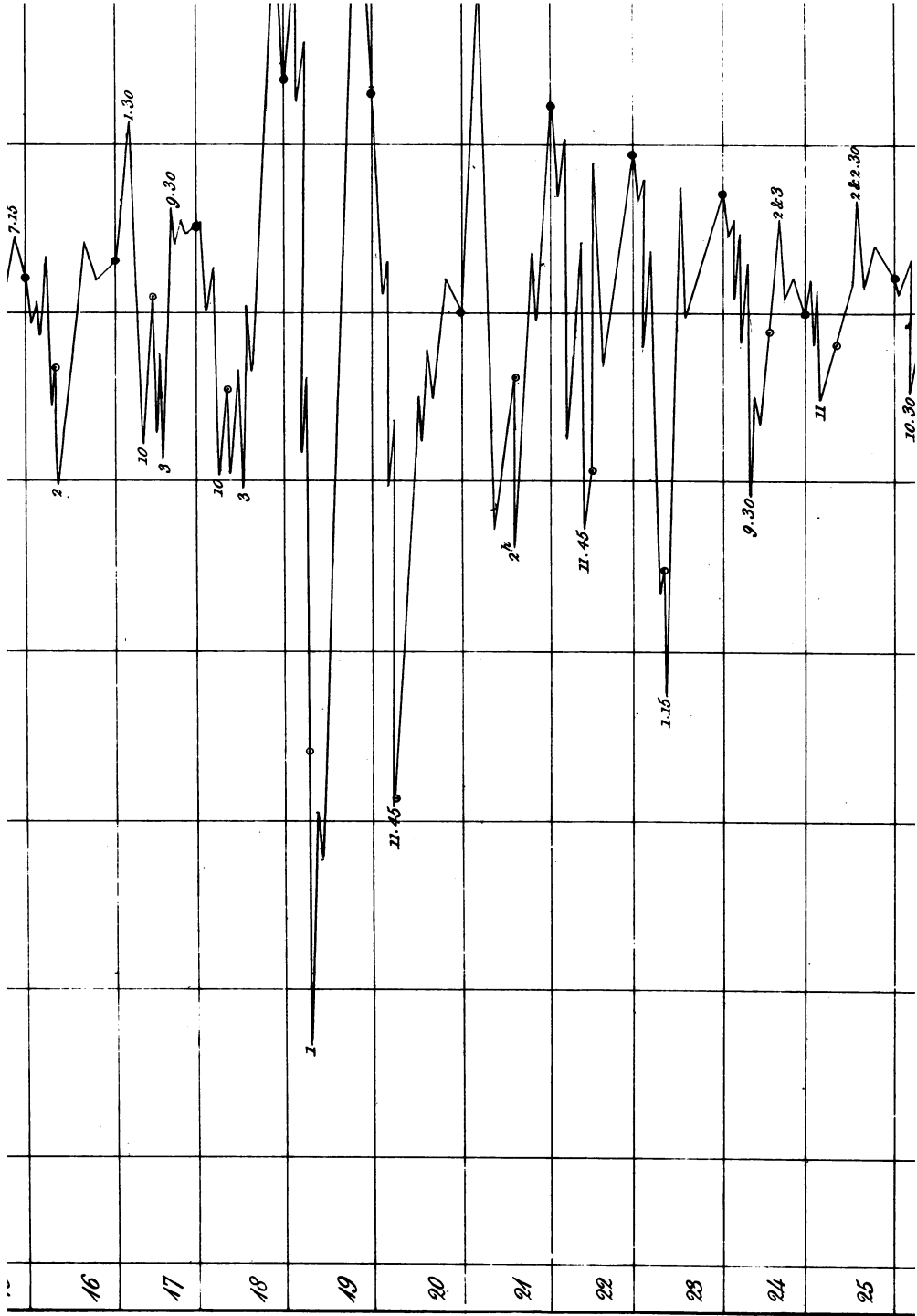
St. Barre, Mo.

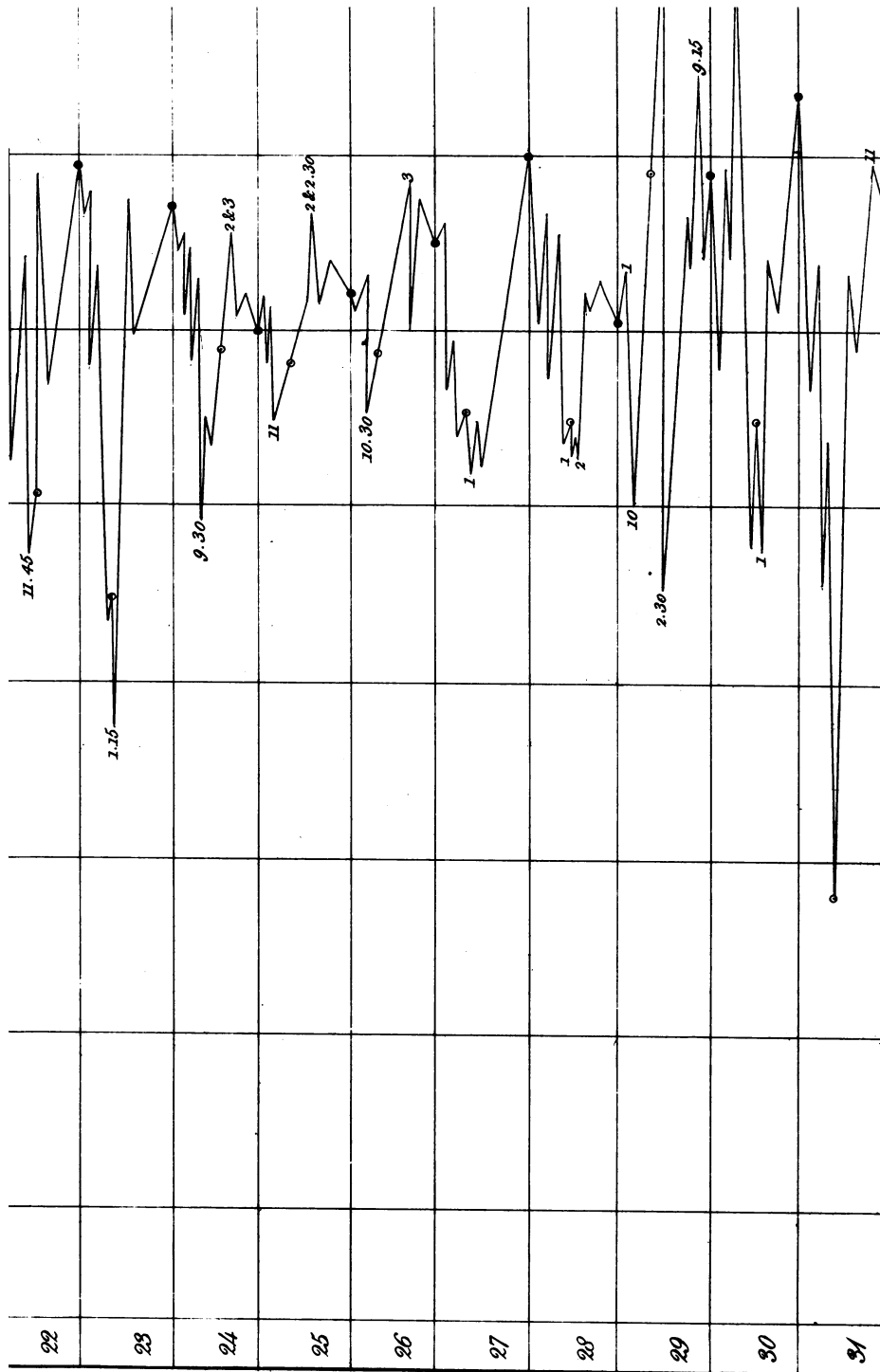
if the intervening figures, the intermediate hours.

MARCH. — 1895.









Note, The dark circular spots, indicate Midnight; the light ones Noon; and the intervening figures, the intermediate

left hand, or towards the magnetic meridian; from whence it is inferred, that these contrary effects balance each other at S. 85° W. and produce what has hitherto been termed the line of minimum daily variation. Nevertheless it is a singular coincidence, that the *true bearing* of this line at Port Bowen (viz. S. $38^{\circ} 4'$ E.) agrees nearly with Mr. BARLOW's determination at Woolwich. It would, however, be desirable to have other observations, at places differing much in magnetic position, before drawing any conclusions as to the probability of its dependance on some general cause; especially, since the needle after remaining absolutely stationary for three successive days at S. 85° W, commenced moving with its north end towards the *left hand*, or west point of the compass, at half-past three P. M. on the 27th of March; without any apparent cause whatever, and that it did not again become stationary during the rest of the observations at this point, which were continued until the 5th of April; in the course of which, as will be seen, its north end sometimes proceeded towards the *left*, and at others towards the *right hand*, during the time of westerly daily variation.

Whether this movement of the needle, on the 27th of March, took place in consequence of the changes of intensity in the opposing magnets (which were covered with snow), arising from the effects of temperature, or from the sudden variations of intensity of the horizontal needle which take place in short intervals of time, to which, I am most disposed to attribute it, is difficult to decide; it was not considered to be due to the effects of electricity, as there was no appearance of the Aurora* at the time, nor was

* The Aurora generally appeared about north by compass, extending in an arch

the existence of that phenomenon, in the atmosphere, detected by the electrometer.

Towards the end of May, however, I commenced another set of observations (at S. 85° W.), but the needle never became stationary throughout their continuance ; its north end sometimes proceeding towards the north, at others towards the south, during the time of westerly daily variation, and that occasionally the needle was observed to vibrate in small arcs, as already noticed at its other azimuthal positions.

It will also be seen, on looking over the preceding observations, that the times of maximum westerly, and easterly daily variation, by this needle, differ on many occasions very considerably from those by the suspended needle : this difference it may be observed, arises from the circumstance of the observations on each needle not being made simultaneously, as well as from the minuteness of some of the phenomena escaping observation by the suspended needle ; but which were elicited by this needle, proportionally to its reduced directive force. Besides these observations on the daily changes of the horizontal needle, I also attempted a similar set on the dipping needle, but the difficulty of adjusting the magnets was such, as to prevent me from obtaining any satisfactory results.

Port Bowen, July 1st, 1825.

from about N. E. to N.W. at an elevation of from 10 to 20 degrees, with streamers sometimes shooting towards the zenith. At times when it was brightest, although not very brilliant during any part of the winter, I have frequently watched this needle, without ever being able to detect a change, that could be ascribed to its influence.